CHINA RAILWAY DESIGN CORPORATION
КОСТЕ РАЦИНА 16б, 11000 БЕОГРАД
САОБРАЋАЈНИ ИНСТИТУТ ЦИП д.о.о.
11000 БЕОГРАД, НЕМАЊИНА 6/IV
тел: 011/3618-134, факс: 011/3618-324,
web site: www.sicip.co.rs

2/4.2.1 НАСЛОВНА СТРАНА

2/4.2 ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА

Инвеститор:	„Инфраструктура Железнице Србије“ а.д. Немањина 6/4, Београд
Наручилац:	Конзорцијум фирми: China Railway International Corporation Ltd. China Communication Construction Company Ltd. (CCCC)
Објекат:	Пруга Београд - Суботица државна граница (Келебија), **ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА),** у Новом Саду, Кисачу, Степановићеву, Змајеву, Врбасу, Ловћенцу, Малом Иђошу, Бачкој Тополи, Жеднику, Наумовићеву и Суботици, К.О. Нови Сад I, К.О. Нови Сад IV, К.О. Кисач, К.О. Руменка, К.О. Степановићево, К.О. Ченеј, К.О. Бачко Добро Поље, К.О. Врбас, К.О. Врбас - град, К.О. Змајево, К.О. Куцура, К.О. Ловћенац, К.О. Мали Иђош, К.О. Фекетић, К.О. Бачка Топола, К.О. Бачка Топола - Град, К.О. Мали Београд, К.О. Биково, К.О. Доњи Град, К.О. Жедник, К.О. Нови Град, К.О. Палић, К.О. Стари Град, на катастарским парцелама према списку приложеном у Главној свесци
Врста техничке документације:	**ПГД-** Пројекат за грађевинску дозволу
Назив и ознака дела пројекта:	**ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА** **2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)**
За грађење / извођење радова:	Нова градња
Пројектант:	China Railway Design Corporation Serbia Ogranak Beograd Косте Рацина 16б 11000 Београд, Србија
Одговорно лице пројектанта:	Генерални директор: 耿欣 (Генг Ксин)
Потпис:	XIN GENG Digitally signed by XIN GENG Date: 2021.08.03 10:01:59 +02'00'
Одговорни пројектант:	Зоран Луковић, дипл.грађ.инж Лиценца број: 310 3032 03
Потпис:	ЗОРАН ЛУКОВИЋ 011041396 Sign Digitally signed by ЗОРАН ЛУКОВИЋ 011041396 Sign Date: 2021.08.01 16:03:23 +02'00'
Број дела пројекта:	2020-001-ГС-2/4.2
Место и датум:	Београд, април 2021.год.

CeS.TRA

ТЕХНИЧКА КОНТРОЛА ПРОЈЕКТА ЗА ГРАЂЕВИНСКУ ДОЗВОЛУ

2/4.2 ЗИД ОД АРМИРАНЕ ЗЕМЉЕ ПОРЕД СТАДИОНА ФК НОВИ САД
(km 0+783 ~ km 0+916)

Објекта: Пруга Београд - Суботица - државна граница (Келебија), **ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)**, у Новом Саду, Кисачу, Степановићеву, Змајеву, Врбасу, Ловћенцу, Малом Иђошу, Бачкој Тополи, Жеднику, Наумовићеву и Суботици, К.О. Нови Сад I, К.О. Нови Сад IV, К.О. Кисач, К.О. Руменка, К.О. Степановићево, К.О. Ченеј, К.О. Бачко Добро Поље, К.О. Врбас, К.О. Врбас - град, К.О. Змајево, К.О. Куцура, К.О. Ловћенац, К.О. Мали Иђош, К.О. Фекетић, К.О. Бачка Топола, К.О. Бачка Топола - Град, К.О. Мали Београд, К.О. Биково, К.О. Доњи Град, К.О. Жедник, К.О. Нови Град, К.О. Палић, К.О. Стари Град, на катастарским парцелама према списку приложеном у Главној свесци, на основу Закона о планирању и изградњи („Службени гласник РС” бр. 72/09, 81/09 – исправка, 64/10 – одлука УС, 24/11, 121/12, 42/13 – одлука УС, 50/13 – одлука УС, 98/13 – одлука УС, 132/14, 145/14, 83/18, 31/19, 37/19 - др. Закон, 9/20 и 52/21) и одредби Правилника о садржини, начину и поступку израде и начину вршења контроле техничке документације према класи и намени објеката (“Службени гласник РС”, бр. 73/2019), извршена је техничка контрола предметне документације, од стране предузећа CESTRA d.o.o. Београд.

ПРОЈЕКАТ СЕ ПРИХВАТА

Вршилац техничке контроле: CESTRA d.o.o,
Макензијева 57, Београд

Број лиценце: 351-02-03374/2020-09 од 18.03.2021.

Одговорно лице/Заступник: Директор:
Драган Милић, дипл.грађ.инж.

Потпис:

Вршилац техничке контроле: Немања Шеловић дипл.грађ.инж.
Број лиценце: 310 P214 17

Потпис:

Број техничке документације: A10312-61/21

Место и датум: Београд, 2021.

2/4.2.2 САДРЖАЈ

2/4.2.1	Насловна страна	
2/4.2.2	Садржај	
2/4.2.3	Решење о одређивању одговорног пројектанта	
2/4.2.4	Изјава одговорног пројектанта	
2/4.2.5	Текстуална документација	
2/4.2.5.1	Технички опис	
2/4.2.6	Нумеричка документација	
2/4.2.6.1	Нумеричка документација	
2/4.2.6.2	Предмер и предрачун радова	
2/4-4.7	Графичка документација	
Цртежи	Назив цртежа	Размера
2/4.2-Ц1	СИТУАЦИЈА	1:500
2/4.2-Ц2.1~Ц2.4	Попречни пресеци зида од армиране земље	1:100
2/4.2-Ц3	ИЗГЛЕД ЗИДА ОД АРМИРАНЕ ЗЕМЉЕ	1:200
2/4.2-Ц4.1~Ц4.2	Детаљ бетонског блока	1:5
2/4.2-Ц5	Систем блокова и темељи, цртеж конструкције круне зида	1:20
2/4.2-Ц6	Цртеж арматуре темеља	1:10
2/4.2-Ц7	Цртеж арматуре круне зида	1:10

2/4.2.3 РЕШЕЊЕ О ОДРЕЂИВАЊУ ОДГОВОРНОГ ПРОЈЕКТАНТА

На основу члана 128а, Закона о планирању и изградњи ("Службени гласник РС", бр. 72/09, 81/09-исправка, 64/10- одлука УС, 24/11, 121/12, 42/13-одлука УС, 50/13-одлука УС, 98/13-одлука УС, 132/14, 145/14, 83/2018, 31/2019, 37/2019 - др.закон и 9/2020) и одредби Правилника о садржини, начину и поступку израде и начину вршења контроле техничке документације према класи и намени објеката ("Службени гласник РС", бр. 73/2019) као:

О Д Г О В О Р Н И П Р О Ј Е К Т А Н Т

за израду **ПРОЈЕКТА ПОТПОРНИХ КОНСТРУКЦИЈА - 2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)**, који је део ПГД - Пројекта за грађевинску дозволу за изградњу пруге Београд - Суботица државна граница (Келебија), **ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)**, у Новом Саду, Кисачу, Степановићеву, Змајеву, Врбасу, Ловћенцу, Малом Иђошу, Бачкој Тополи, Жеднику, Наумовићеву и Суботици, К.О. Нови Сад I, К.О. Нови Сад IV, К.О. Кисач, К.О. Руменка, К.О. Степановићево, К.О. Ченеј, К.О. Бачко Добро Поље, К.О. Врбас, К.О. Врбас - град, К.О. Змајево, К.О. Куцура, К.О. Ловћенац, К.О. Мали Иђош, К.О. Фекетић, К.О. Бачка Топола, К.О. Бачка Топола - Град, К.О. Мали Београд, К.О. Биково, К.О. Доњи Град, К.О. Жедник, К.О. Нови Град, К.О. Палић, К.О. Стари Град, на катастарским парцелама према списку приложеном у Главној свесци, одређује се:

Зоран Луковић, дипл.грађ.инж_____ 310 3032 03

Пројектант:	CHINA RAILWAY DESIGN CORPORATION SERBIA OGRANAK BEOGRAD, Косте Рацина 16б
Одговорно лице/заступник:	Генерални директор: Генг Ксин, дипл.инж.
	Потпис:
Број техничке документације:	2020-001-ГС-2/4.2
Место и датум:	Београд, април 2021.год.

2/4.2.4 ИЗЈАВА ОДГОВОРНОГ ПРОЈЕКТАНТА

Одговорни пројектант **ПРОЈЕКТА ПОТПОРНИХ КОНСТРУКЦИЈА - 2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)** који је део ПГД -Пројекта за грађевинску дозволу за изградњу пруге Београд - Суботица државна граница (Келебија), **ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)**, у Новом Саду, Кисачу, Степановићеву, Змајеву, Врбасу, Ловћенцу, Малом Иђошу, Бачкој Тополи, Жеднику, Наумовићеву и Суботици, К.О. Нови Сад I, К.О. Нови Сад IV, К.О. Кисач, К.О. Руменка, К.О. Степановићево, К.О. Ченеј, К.О. Бачко Добро Поље, К.О. Врбас, К.О. Врбас - град, К.О. Змајево, К.О. Куцура, К.О. Ловћенац, К.О. Мали Иђош, К.О. Фекетић, К.О. Бачка Топола, К.О. Бачка Топола - Град, К.О. Мали Београд, К.О. Биково, К.О. Доњи Град, К.О. Жедник, К.О. Нови Град, К.О. Палић, К.О. Стари Град, на катастарским парцелама према списку приложеном у Главној свесци:

Зоран Луковић, дипл. грађ.инж.

И З Ј А В Љ У Ј Е М

1. да је пројекат у свему у складу са издатим Локацијским условима:

-бр.ROP-MSGI-28188-LOCH-4/2020, Заводни број: 350-02-00031/2020-14 од 06.04.2020,

-бр.ROP-MSGI-28188-LOCH-4/2020, Заводни број: 350-02-00031/2020-14 од 07.04.2020 - Решење о исправци грешке,

-бр.ROP-MSGI-7141-LOC-1/2020, Заводни број: 350-02-00109/2020-14 од 08.05.2020,

-бр.ROP-MSGI-931-LOC-3/2020, Заводни број: 350-02-00192/2020-14 од 29.05.2020;

2. да је пројекат израђен у складу са Законом о планирању и изградњи, прописима, стандардима и нормативима из области изградње објеката и правилима струке;

3. да је пројекат у свему у складу са начинима за обезбеђење испуњења основних захтева за објекат прописаних елаборатима и студијама.

Одговорни пројектант:	Зоран Луковић, дипл.грађ.инж.
Број лиценце:	310 3032 03
	Потпис:
Број техничке документације:	2020-001-ГС-2/4.2
Место и датум:	Београд, април 2021.год.

2/4.2.5 ТЕКСТУАЛНА ДОКУМЕНТАЦИЈА

2/4.2.5.1 ТЕХНИЧКИ ОПИС

ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА - 2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (Km 0+783 ~ km 0+916)

Садржај

1 Увод
2 Стандарди
3 Геотехничке карактеристике тла
4 Избор зидова од армиране земље
  4.1 Зидови од сегментних блокова
  4.2 Бетонски блокови
  4.3 Геомрежа
  4.4 Темељи
5 Методе пројектовања зидова од армиране земље
  5.1 Димензије конструкција
  5.2 Парцијални коефицијент
  5.3 Анализа спољашње и унутрашње стабилности
    5.3.1 Анализа спољашње стабилности
    5.3.2 Анализа унутрашње стабилности
  5.4 Глобална анализа стабилности
  5.5 Анализа чврстоће бетонских блокова
6 Анализа сеизмике
7 Пројекат зидова од армиране земље
8 Гранично стање употребљивости
9 Изградња зида од армиране земље

1 УВОД

Пројектом нове пруге Нови Сад - Келебија, колосек VK1 железничког чвора Нови Сад налази се на левој страни трасе испред стационаже km78 +427 магистралне мађарско-српске железничке пруге. Да би се избегло да се због десног колосека заузима стадион "ФК Нови Сад", да би се смањила експропријација земљишта и рушење, потпорни зид се налази на нагибу насипа са леве стране на десном колосеку.

Према Идејном пројекту, који је одобрила Републичка Ревизиона Комисија, потпорни зид од армиране земље постављен је нагибу насипа са леве стране десног путничког колосека, на стационажи km0+783~km0+916, а укупна дужина конструкције је око 134m.

У поређењу са традиционалним армирано-бетонским зидом, зид од армиране земље је флексибилна потпорна конструкција која има предности у погледу деформација и отпорности на земљотрес и његовим коришћењем постижу се уштеде у погледу армираног бетона, заузимања земљишта и времена извођења радова.

У фази Пројекта за грађевинску дозволу задржава се решење за зид од армиране земље за овај део, а за формирање чела зида користе се бетонски блокови.

2 Стандарди

У Србији је не постоји техничка спецификација за пројектовање зидова од армиране земље.

EN 14475 Предговор: Пројекат конструкција од армиране земље тренутно се изводи користећи националне стандарде као што су BS 8006 (1995), NF P 94-220 (1998) и други стандарди. У ствари, EN 1997-1, Eurocode 7 (Геотехнички пројекат) тренутно не покрива детаљни пројекат конструкција од армиране земље. Вредности делимичних фактора и фактора оптерећења дате у EN 1997-1 нису калибрисане за конструкције од армиране земље.

Стога се за овај пројекат углавном користи британски стандард BS 8006-1:2016: Стандард за ојачанау/ армирану земљу.

За тестирање геомреже, користи се спецификације геосинтетике EN и ISO.

Спецификације које су коришћене у техничким извештајима су следеће:

—Европске норме за конструкције:

EN 1992-1-1, Eurocode 2: Пројектовање бетонских конструкција - Део 1-1: Општа правила и

правила за зграде.

EN 1997, Eurocode 7: Пројектовање Геотехничких конструкција.

EN 1998, Eurocode 8: Пројектовање конструкција отпорних на земљотрес.

EN 14475:2006, Извођење посебних геотехничких радова -армирана земља.

—Британски стандарди за зидове од армиране земље

BS 8006-1:2010+A1:2016: Стандард за ојачање/армирану земљу и друге испуне.

—Амерички стандарди за зидове од армиране земље

AASHTO LRFD Спецификације пројекта моста (део зидови од армиране земље) 2017/8.

FHWA-NHI-10-024 Пројектовање и извођење механички стабилизованих зидова од земље и ојачаних косина тла - Том 1.

—Немачки стандарди за пројектовање зидова од армиране земље

Предлози за ојачање геосинтетике EBGEO.

— Кинески стандард за зидове од армиране земље

ТВ 10025:2019, Стандард за пројектовање потпорних конструкција за доњи строј пруге.

— Спецификација за експерименте са геомрежом

EN ISO 10319:2015, Геосинтетика – Затезно испитивање.

EN 13250:2014+A1:2015, Геотекстили и производи повезани са геотекстилом - Карактеристике потребне за употребу у изградњи железница.

EN 13251:2014+A1:2015, Геотекстили и производи повезани са геотекстилом -

Карактеристике потребне за употребу у земљаним радовима, темељима и потпорним конструкцијама.

EN ISO 13431:1999, Геомреже и производи повезани са мрежом - Одређивање затезног пузања и пуцања пузања.

ISO/TR 20432:2007, Смернице за одређивање дуготрајне чврстоће геосинтетике за ојачање тла.

3 Геотехничка својства тла

Подаци о геотехничким карактеристикама темељног тла добијени су из геоелабората "CRDC-Retaining wall km0+783- km0+916".

За карактеристичне вредности природног темељног тла које су одређене овим геоелаборатом видети табелу 3-1.

За минималне геолошке вредности испуне зида од армиране земље и земље која остаје на насипу, а које је искуствено одредио пројектант, видети табелу 3-2.

Током процеса изградње, треба проверити геотехничке карактеристике тла у сваком хомогеном делу, а узорке однети у лабораторију на испитивање. Ако су геотехничка својства нижа од вредности у табели 3-2, треба предузети одговарајуће мере како би се осигурала стабилност радова.

У геоелаборату се види да је ниво подземне воде нижи од висине темеља зида од армиране земље, а пројекат није узео у обзир утицај воде на геотехничке карактеристике. Постављање дренажног слоја иза зида од армиране земље може да осигура да неће настати притисак воде у испуни од армиране земље. У прорачуну стабилности за ову локацију није узет у обзир утицај притиска воде.

Табела 3-1 Геотехничке карактеристике природног темељног тла

Бр.	**Назив**	Дебљина слоја	Специфична тежина γ	Ефективна кохезија c'	Ефективни угао трења φ'	Модул сабијања Es
		m	kN/m^3	kPa	°	kPa
1	nt	0.5				
2	Clsi-siSa	5.4	20.3	12	26	6601
3	SaP	15.0	20.1	5	30	10000
Усвојена пројектна вредност (хомогено темељно тло)			**20.3**	**12**	**26**	
Бр.	**Назив**	Индекс пластичности Ip	Индекс доследности Ic	Природни садржај воде w	Граница течности wl	Граница скупљања wp
		/	/	%		
1	nt					
2	Clsi-siSa	11.1	1	20~24.6	31	20.6
3	SaP					

Табела 3-2 Механичка својства тла испуне зида од армиране земље

Део испуне	Специфична тежина（γ）	Ефективна кохезија（c'）	Ефективни угао трења（φ'）
	kN/m^3	kPa	（°）
Испуна армиране земље	19.5	0	33
Испуна од задржане земље	19.5	0	30

4 Избор типа зида од армиране земље

4.1 Сегментни блок зидови

Постоји много врста потпорних зидова од армиране земље, сваки са својим карактеристикама. Избор типа зида за овај пројекат углавном се базира на следећем:

— Потпорни зидови од армиране земље граде се на темељном тлу.

— Сви елементи конструкције за изградњу треба да буду лаки ради транспорта и уградње.

— Зидови не захтевају одржавање током експлоатације.

С тога је за зид од армиране земље узет систем сегментних блок зидова са једноаксијалном затезном геомрежом. Такав систем укључује зидове од префабрикованих бетонских блокова, конекторе за зидне блокове, аксијалне растегнуте полиетиленске (HDPE) геомреже високе густине, HDPE решетке за повезивање геомрежа и материјал за сабијање испуне.

4.2 Бетонски блокови

Чеону површину потпорних зидова од армиране земље чине бетонски блокови. Детаљи се могу наћи у цртежима пројекта.

На дну бетонских блокова треба да буде испупчена површина, а на врху површина са жлебом, тако да се једноаксијална затегнута геомрежа може причврстити специјалним пластичним конекторима како би се обезбедило da пројектована чврстоћа геомреже на површини зида не буде смањена.

Стога овај систем може узети у обзир укупну пројектовану чврстоћу геомреже у статичким и сеизмичким условима.

4.3 Геомрежа

Геомрежа у зидовима од армиране земље треба да буде повезана са сегментираним бетонским блоковима.

Како би се обезбедило да чврстоћа везе достигне пројектовану чврстоћу арматуре, геомрежа треба да се затегне у једном правцу. Овај тип геомреже је интегрални производ који се добија ударањем и растезањем HDPE панела, а може се повезати са зидом од блокова помоћу пластичних конектора како би се обезбедила потребна чврстоћа везе.

4.4 Темељи

Потпорни зид од армиране земље је флексибилна конструкција која се може прилагодити различитим слегањима без угрожавања своје стабилности. Систем зида одабран за овај пројекат је систем сегментираног бетонског блока који је заправо полукрута конструкција.

Како би се избегло хоризонтално померање бетонских блокова и напрслине у систему завршне обраде, пројектован је бетонски темељ "L" профила, који карактеришу предњи зуби који спречавају директно клизање постоља зида ка спољa. Погледати пројектни цртеж темељ.

5 Метода пројектовања зидова од армиране земље

Пројекат је у потпуности усклађен са стандардима EN1997-1 и EN1998, а заснован је на методи граничног стања, и то: граничном стању носивости и граничном стању употребљивости.

Процес пројектовања зидова од армиране земље је следећи:

• Најпре се мора решити унутрашња стабилност, да би се одредио размак између геомреже, дужина геомреже и веза са радном површином. Овим се успоставља укупни интегритет зида од армиране земље.

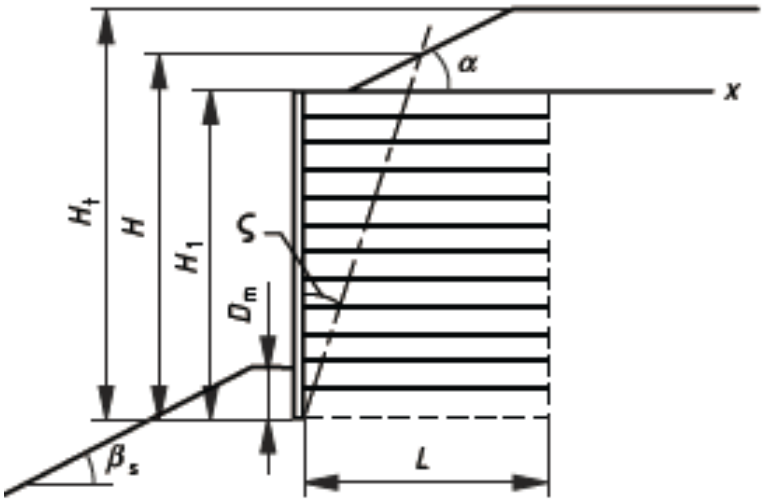
• Спроводи се испитивање спољне стабилности против превртања, клизања и оштећења темеља, и у складу с тим проверава или модификује унутрашњи пројекат. Овим се потврђује да ће зид од армиране земље остати стационаран.

• Спроводи се анализа укупне стабилности да би се осигурало да не постоји механизам оштећења који укључује армирану земљу, испуну иза армиране испуне и темељно тло. Овим се потврђује да ће зид од армиране земље и околно земљиште остати непомерљиви.

• Остала разматрања укључују завршне детаље зида и спољну дренажу. Овим се решавају остали могући проблеми у вези са стабилношћу.

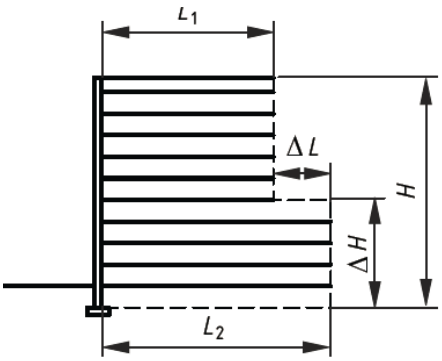
5.1 Величина конструкције

У комбинацији са задатом висином зида од армиране земље и карактеристикама темељног тла локације, укупна геометрија конструкције и захтеви за минималну почетну величину приказани су на слици 5.1.



H = Mechanical height
H_1 = Facing height
H_t = Total height
ς = Arc tan 0.3
L = Reinforcement length
D_m = Embedment depth
$L \geq 0.7H$ and ≥ 3 m

а) Правоугани пресек



$L_1 \geq 0.7H$ and ≥ 3 m
$\Delta H \geq 2\,\Delta L$

б) Степенасти пресек

Сл. 5.1 Геометрија и димензије зида

Према прописима о дубини смрзавања у Србији, дубина уградње зида од армиране земље Dm не треба да буде мања од 0,8m.

5.2 Парцијални коефицијент

Тренутно у различитим земљама не постоје парцијални коефицијенти за зидове од армиране земље. Позивајући се на саобраћајно оптерећење аутопута из стандарда BS 8006, парцијални коефицијенти за овај пројекат су приказани у табели 5.2.

Табела 5.2 Парцијални коефицијенти коришћени у овом пројекту

Парцијални коефицијенти			Гранично стање носивости		Гранично стање употребљивости
			A	B	C
Коефицијенти оптерећења	Густина земље за испуну зида	Квалитет армиране земље: f_{fs}	1,5	1,0	1,0
		Квалитет земље за испуну на врху армиране земље: f_{fs}	1,5	1,0	1,0
	Притисак земље иза армиране земље: f_{fs}		1,5	**1,5**	1,0
	Спољно сопствено оптерећење	Оптерећење колосека: f_f	1,5	1,0	1,0
	Спољно покретно оптерећење	Оптерећење воза: f_q	1,5	1,0	0
Коефицијенти материјала тла: fms	tan (φ' p)		1,0		1,0
	c ’		**1,6**		1,0
	c_u		1,0		1,0
Коефицијенти материјала арматуре: fm	Примењује се на основну чврстоћу арматуре **Тв**		Вредност fm треба да буде консистентна са врстом арматуре која ће се користити и пројектним веком коришћења		
Коефицијенти интеракције земљишта и арматуре	Коефицијент клизања дуж површине арматуре: fs		fs=1,3		fs=1,0
	Коефицијент отпора на извлачење арматуре: fq		fp=1,3		fp=1,0
Парцијални коефицијенти сигурности	Носивост темеља fms: примењује се q_{ult}		fms=1,35		NA
	Клизање дуж темеља конструкције или било које хоризонталне површине где постоји додир земље са земљом fs		fs=1,2		NA

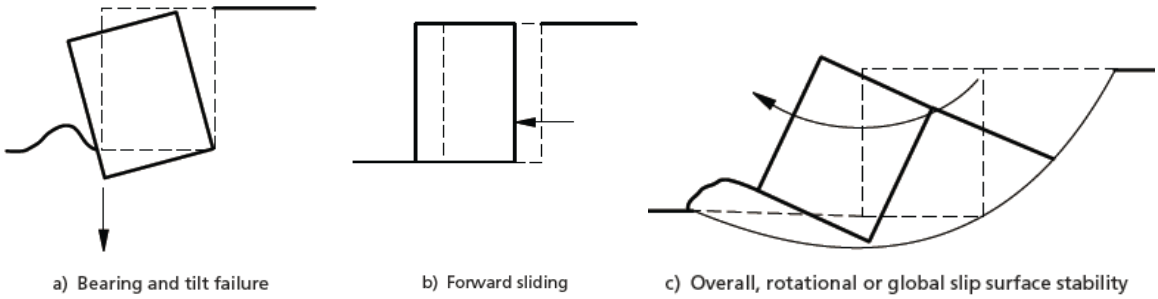
5.3 Анализа спољне и унутрашње стабилности

5.3.1 Анализа спољне стабилности

Потпорни зид од армиране земље у суштини и даље спада у категорију гравитационих потпорних зидова, а постојећи стандарди за пројектовање потпорних зидова од армиране земље претпостављају да је армирана земља круто тело. Метода анализе његове спољне стабилности у суштини је иста као и за традиционалне потпорне зидове и укључује носивост, превртање, клизање и лом по луку, као што је приказано на слици 5.3.1-1.

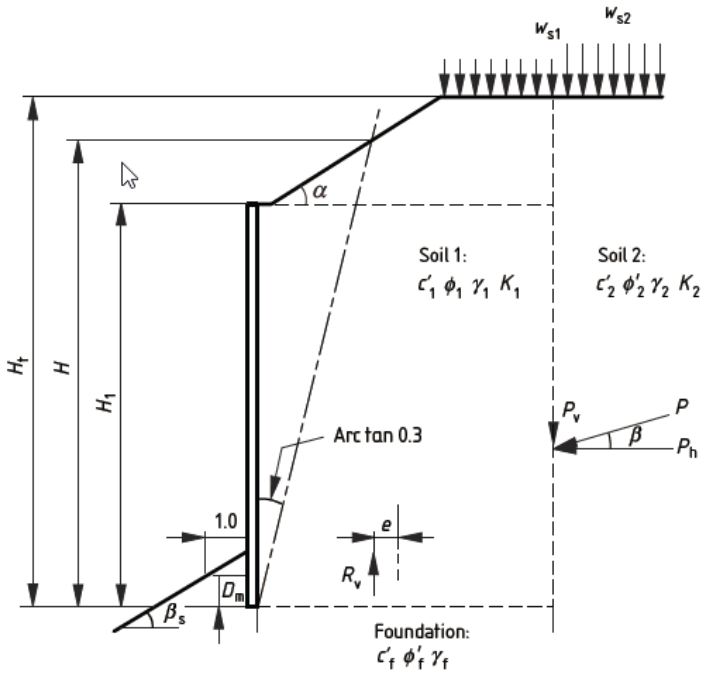
Анализа носивости и превртања, типични притисак који врши конструкција од армиране земље на

темељ и пројектовани претпостављени притисак потпоре заснивају се на Meyerhof расподели.



Сл. 5.3.1-1 Анализа спољне стабилности (с лева на десно): Носивост и превртање; клизање директно на постољу; ротација или клизање у целости

Дефиниција карактеристика тла армиране земље, испуне и темеља, као и главног оптерећења и додатног оптерећења која се узимају у обзир при прорачуну стабилности, приказани су на слици 5.3.1-2.



NOTE $\beta = 0$ for tie back wedge method, $\beta = (1.2 - L/H)\phi'_2$ for coherent gravity method.

Слика 5.3.1-2 Дефиниција карактеристика тла и оптерећења

5.3.2 Анализа унутрашње стабилности

Механизам оштећења унутрашње стабилности потпорног зида од армиране земље обухвата два мода: затезно прекидање арматуре и извлачење арматуре. Током вршења анализе унутрашње стабилности, цела конструкција армиране земље је подељена на два дела на основу претпостављене локације површине прелома арматуре: активну и пасивну зону. Функција арматуре

је да апсорбује напрезање које ствара земља у активној зони када су чврстоћа арматуре и сила сидрења између арматуре и земље довољни, а онда га затезном силом арматуре преноси у пасивну зону и затим постепено шири од арматуре на земљу у пасивној зони.

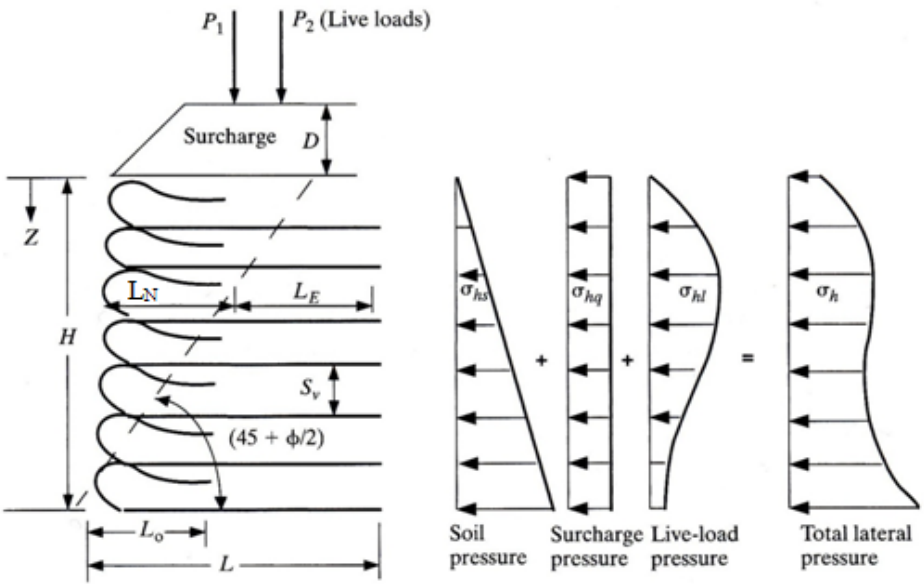
Срж пројекта унутрашње стабилности потпорног зида од армиране земље је прорачун силе арматуре. Прорачун затезне силе арматуре директно утиче на пројектовану чврстоћу, размак и унутрашњу стабилност арматуре.

Максимална затезна сила Tj сваког слоја арматуре је кључ унутрашње стабилности и економичног пројекта потпорног зида од армиране земље.

Према одредбама стандарда BS 8006, за унутрашњу стабилност потпорног зида армираног геомрежом претпоставља се tie-back модел, где је површина лома равна линија која почиње од прста и нагнута је (45°+φ/ 2), као што је приказано на слици 5.3.2-1.

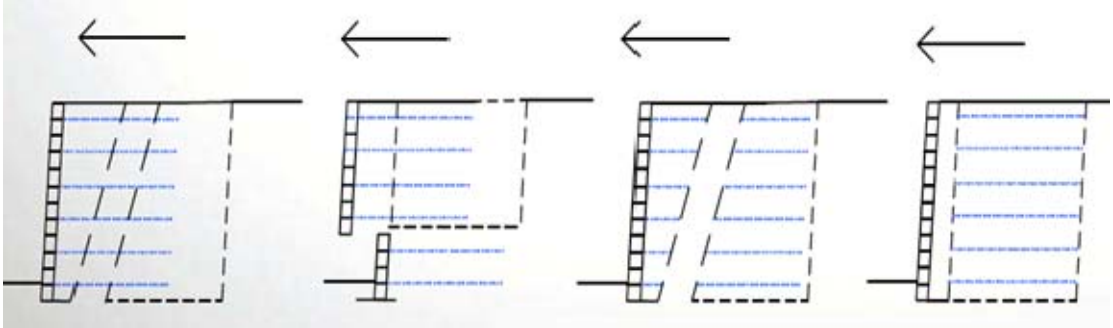
Да би се утврдио вертикални размак између слојева геомреже, претпоставља се да су силе сабијања земље за насипање и вишка земље линеарно распоређене и задовољавају услов Rankine-овог активног притиска земље. Boussinesq теорија еластичности користи се за израчунавање покретног оптерећења земље за насипање.

Укупна дужина геомреже L биће дужина зоне сидрења L_E иза површине прелома, плус неактивна дужина геомреже у активној зони испред површине прелома L_N, односно $L=L_E+L_N$.



Сл. 5.3.2-1 Шема анализе унутрашње стабилности зида од армиране земље

Анализа унутрашње стабилности је решила следеће механизме оштећења (Сл. 5.3.2-2): извлачење геомреже; директно клизање низ геомрежу; затезно прекидање геомреже; веза геомреже и блока зида.



Сл. 5.3.2-2 Механизам унутрашњег оштећења (с лева на десно): извлачење геомреже; директно клизање; затезно прекидање геомреже; оштећење везе геомреже и блока зида

5.4 Анализа укупне стабилности

Након завршетка пројекта унутрашње и спољне стабилности, потребно је спровести анализу укупне стабилности како би се осигурало да не постоји механизам оштећења за армирану земљу, тло иза армиране земље и темељно тло.

Анализу укупне стабилности треба извршити на следећи начин:

— Клизање дуж кружних површина (ротациона стабилност)

Под претпоставком да постоји кружна површина лома, тло окружено овом површином подељено је на мноштво клизишта подељених вертикалним површинама, а за свако клизиште се могу израчунати активни моменти изазвани потиском тла, моменти отпора и/или кохезије изазвани трењем и затезна чврстоћа слоја геомреже (види слику 5.4-1); коефицијент сигурности је однос збира момената отпора и збира активних момената; проучавано је много кружних површина и за сваку од њих формула за израчунавање коефицијента сигурности (FS) је следећа:

$$FS = FS_{unreinforced} + M_r / M_a$$

$FS_{unreinforced}$ = коефицијент сигурности за одабрану кружну површину, не узимајући у обзир постојање арматуре од геомреже;

M_r = момент отпора који пружа арматура од геомреже = Σ Ti·bi;

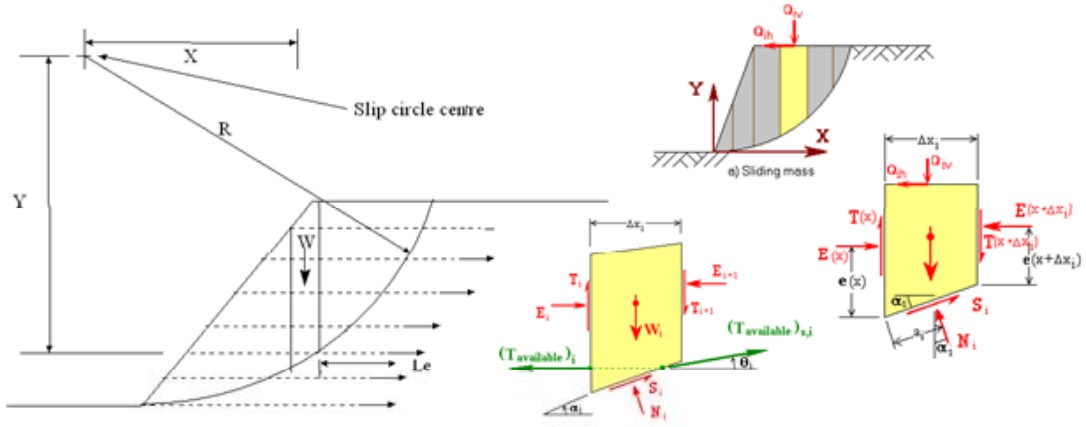
Ti = затезна чврстоћа на пресеку i-тог дела арматуре и одабране кружне површине;

bi = крак силе геомреже која почиње од центра одабраног круга;

M_a = активни момент.

За анализу ротационе стабилности обично се користи Bishop метода (1955), пошто се овом методом могу узети у обзир све силе које делују на клизишта (Слика 5.4-1).

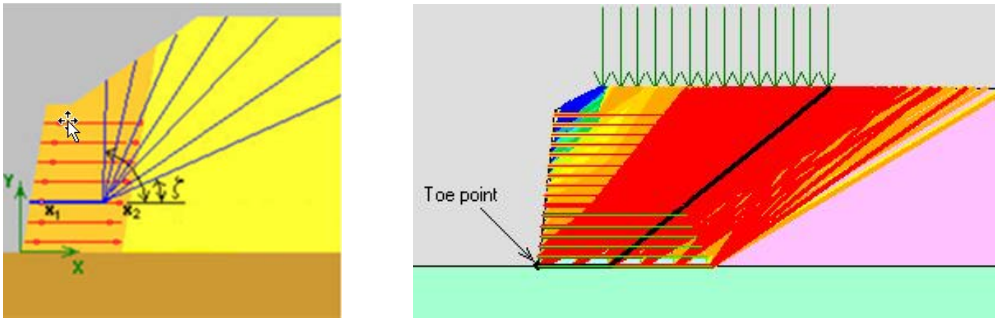
$$FS = \frac{\Sigma\{c_i \times b_i + (W_i - u_i \times b_i + \Delta X_i) \times \tan\varphi_i\} \times \frac{\sec\alpha_i}{1 + \tan\alpha_i \times \tan\varphi_i / F}}{\Sigma W_i \times \sin\alpha_i}$$



Сл. 5.4-1 Шема анализе за ротациону стабилност

— Транслаторно клизање (хоризонтална стабилност)

Маса армиране земље, и можда део масе земље иза њега, могу да клизају као крути блок дуж темеља или дуж једног од слојева геомреже. Стога су проучене бројне билинеарне површине. Хоризонтални сегмент одговара растућем делу сваког слоја геомреже, а нагнути сегмент сваког хоризонталног сегмента има другачији угао за (Слика 5.4-2); израчунавају се силе отпора и активне силе за сваку билинеарну површину, чији однос даје коефицијент сигурности. Ово се назива Spencer методом.



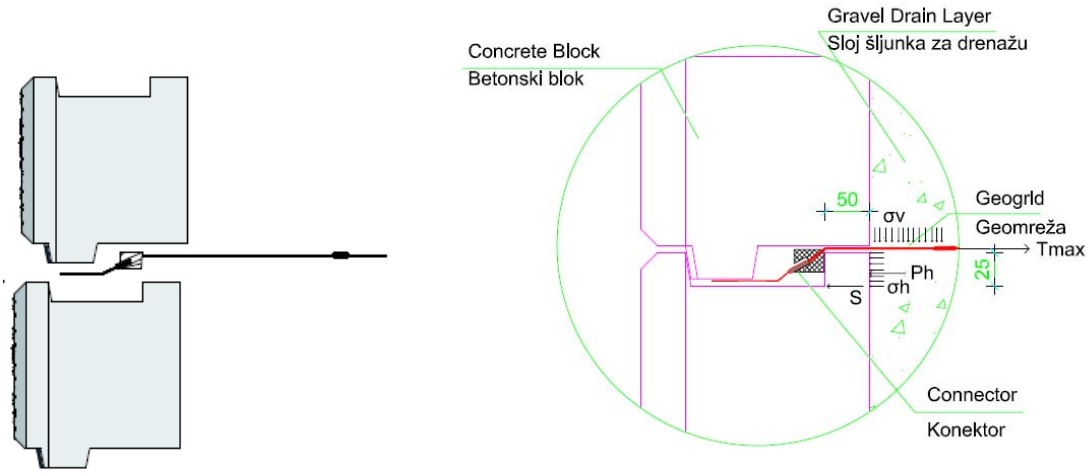
Сл. 5.4-2 Шема анализе за транслаторну стабилност

5.5 Анализа чврстоће на смицање бетонског блока

На споју између геомреже и бетонског блока, затезна сила у геомрежи се опире отпором вертикалног дела бетонског блока, а пластични конектор наслања се на тај вертикално део бетонског блока.

На другој страни вертикалног дела блока, испуна врши хоризонтални притисак услед потиска тла.

Као што је приказано на Слика 5-5, дно бетонског блока је тада подвргнуто сили смицања, што може довести до лома самог бетонског блока ако се премаши чврстоћа на смицање бетона.



Сл. 5-5 Поједностављена шема компонената сила конектора

На основу техничких захтева стандарда EN 1992-1 за компоненте мршавог бетона отпорне на смицање под притиском, анализира се чврстоћа на смицање бетонских блокова.

За пресек где сила смицања VEd и нормална сила NEd делују на притиснуту зону Acc, апсолутну вредност компоненте пројектованог напрезања треба узети као:

$$\sigma_{cp}=N_{Ed}/Acc$$

$$\tau_{cp}=k\ V_{Ed}/Acc$$

Препоручена вредност k=1,5 и треба проверити следеће:

$$\tau_{cp} \leq f_{cvd}$$

where:

if $\sigma_{cp} \leq \sigma_{c,lim}$ $\quad f_{cvd} = \sqrt{f_{ctd}^2 + \sigma_{cp} f_{ctd}}$

or

if $\sigma_{cp} > \sigma_{c,lim}$ $\quad f_{cvd} = \sqrt{f_{ctd}^2 + \sigma_{cp} f_{ctd} - \left(\frac{\sigma_{cp} - \sigma_{c,lim}}{2}\right)^2}$

$$\sigma_{c,lim} = f_{cd} - 2\sqrt{f_{ctd}(f_{ctd} + f_{cd})}$$

where:

f_{cvd} is the concrete design strength in shear and compression
f_{cd} is the concrete design strength in compression
f_{ctd} is concrete design strength in tension

Чврстоћа бетона пројектованог блока је C30/37, а максимално затезно оптерећење арматуре је Tmax=30kN/m. Резултат прорачуна заснован је на најнеповољнијој комбинацији:

τ_{cp}=0.86MPa < f_{cvd}=1.60MPa. Задовољава пројектне захтеве.

6 Сеизмичка анализа

Конструкције од армиране земље имају широку употребу у сеизмички активним областима и добро су се показале при многим јаким земљотресима.

Пројекат конструкција потпорних зидова под сеизмичким оптерећењем изводи се у складу са стандардом EN 1998-5. Међутим, Еурокод се не бави посебно сеизмичким пројектом конструкција од армиране земље.

Извлачећи поуке из европског сеизмичког стандарда за потпорне конструкције и релевантних стандарда за сеизмички пројекат конструкција од армиране земље, за пројектовање модела се користи статичка метода. Наиме, сеизмичка сила која делује на конструкцију је гравитација конструкције помножена са хоризонталним сеизмичким коефицијентом kh.

Према националној мапи дистрибуције сеизмичких зона Србије, сеизмички параметри који се користе у сеизмичком пројекту за зидове од армиране земље су следећи:

Референтно вршно убрзање тла на тлу типа A, a_{gR}=0.1g;

Темељ зида од армиране земље налази се на кохезивном тлу, а категорија слоја се сматра E класом, према коефицијенту тла S=1,4 дефинисаном у члану 3.2.2.2 стандарда EN1998-1;

$a=a_g/g=\gamma_I \times a_{gR}/g=1.0\times 0.1g/g=0.1$

$kh=a\times S/r=0.1\times 1.4/2.0=0.07$

$kv=\pm 0.5kh=\pm 0.035$.

7 Пројекат зида од армиране земље

Према стандарду BS 8006, пројектни век зидова од армиране земље је 120 година.

Конструкција од армиране земље анализирана је и пројектована у статичким и сеизмичким условима. Утврђено је неколико типичних попречних пресека, а за сваки попречни пресек извршена је анализа унутрашње, спољне и укупне стабилности.

Анализе унутрашње и спољне стабилности извршене су помоћу MSEW софтвера који је произвела

компанија Adama Engineering (Massachusetts, USA), а одобрила га је Федерална управа за аутопутеве (FHWA) у САД.

Да би софтвер био компатибилан са спецификацијама BS 8006, EN 1997 и EN 1998, параметри оптерећења и тла су разложени, а сеизмички параметри постављени према сеизмичким коефицијентима kh и kv израчунатим у 6. одељку (за детаље, видети прорачун 2/4- 2.6.2).

Анализе целокупне стабилности у статичким и сеизмичким условима изведене су RESSA софтвером, произведеним у компанији Adama Engineering (Massachusetts, USA) и одобреном од стране Федералне управе за аутопутеве (FHWA) у САД.

Минимални коефицијент сигурности је 1,30 у статичким условима и 1,10 у сеизмичким условима.

Урађени су прорачуни за 4 типична пресека са различитим висинама зида. Све врсте резултата прорачуна израчунати су према максималном граничном стању носивости (комбинација A и комбинација B), односно граничном стању употребљивости (комбинација C), да би се упоређивањем утврдио најнеповољнији резултат сваке комбинације.

Генерално, комбинација B контролише прорачун против клизања и из њега се одређује дужину арматуре; пројектна чврстоћа арматуре обично је одређена граничним стањем употребљивости.

Прорачунски лист 2/4.2.6.2 наводи резултате унутрашње, спољне и укупне анализе стабилности максималне висине зида у статичким и сеизмичким условима.

Коначни распоред геомреже погодан за сваку висину зида пројектован је према резултатима прорачуна. Геомрежа изабрана за ову локацију је:

— RW-95 једноаксијална затезна геомрежа, карактеристичне затезне чврстоће Tchar=95kN/m;

— RW-125 једноаксијална затезна геомрежа, карактеристичне затезне чврстоће Tchar=125kN/m.

Екстраполирана јачина течења на крају пројектног века: T_{CR} мора да испуњава услове пројектног века од 120 година и пројектне температуре од 20°C, вредност T_{CR} предвиђена је BBA сертификатом; T_{CR} типа RW-95 ≥42,5 kN/m; T_{CR} типа RW-125 ≥55,5 kN/m.

Овакав распоред задовољава минималну чврстоћу и дужину геомреже потребне за унутрашњу, спољну и глобалну анализу стабилности.

8 Гранично стање употребљивости

За пројектовану конструкцију од армиране земље, следеће деформације треба узети у обзир у

граничном стању употребљивости:

а) слегање подтла;

б) унутрашње сабијање испуне;

ц) унутрашње напрезање услед течења арматуре;

д) напрезање услед течења испуне са високим ситнозрним садржајем.

Овај пројекат користи следеће мере како би се достигли захтеви граничног стања употребљивости за зидове од армиране земље.

а) Ископавање 0,5m испод темеља конструкције од армиране земље и замена крупнозрном земљом како би зид од армиране земље лежао на стабилном земљишту; користити крупнозрни материјал као испуну за арматуру, са високим степеном збијености Dpr≥95%. На овакав начин решавају се проблеми а), б) и д).

б) Унутрашње напрезање услед течења арматуре

Претпостављено затезно оптерећење према напрезању услед течења на крају пројектног века: T_{CS}, T_{CS} вредност дата је BBA сертификатом. Према пропису BS 8006, максимално дозвољено унутрашње напрезање зидова од армиране земље након изградње са пројектним веком трајања од 120 година је 1%. Пројектна затезна чврстоћа TCS арматуре одређује се према овим условима напрезања и пројектованом температуром од 20°C. Захтеви за пројектовање ове секције су следећи:

RW-95 тип T_{CS}≥18,0 kN/m; RW-125 тип T_{CS}≥24,0 kN/m**.**

9 Изградња зидова од армиране земље

За изградњу конструкције од армиране земље сегментним бетонским блоковима, треба се придржавати следећих грађевинских процедура према детаљним грађевинским цртежима:

Основа темеља (обрада подтла)

—На целој површини зида комплетно ископати и уклонити површинско тло. Према–цртежима, дебљина ископа и замене испод пројектне коте темеља не би требало да буде мања од 0,5m. а према геоелаборату првобитна носивост темеља након ископа треба да достигне $\mathbf{E_{vd}}$**≥20MPa**, ископати и поравнати по дужини геомрежа (L+0,5m), како би се обезбедило хоризонтално истезање геомреже унутар целе пројектне дужине.

—Замена подтла треба да се уради у слојевима. Проверити носивост темеља пре полагања геомрежа тако да задовољава $\mathbf{E_{vd} \geq 30MPa}$.

— Основу темеља треба урадити према коти приказаној на цртежу.

—Уколико се испод темеља налази муљевито тло, оно се мора се комплетно ископати и заменити. Ако носивост темеља након ископа и носивост темеља након замене не удовољавају горе наведеним пројектним захтевима, предузеће се даље мере ојачавања према захтевима надзорног инжењера.

Носивост темеља мора да провери и одобри надзорни инжењер пре следећег корака. Испод темеља облика L изливен је бетонски тампонски слој од бетона C12/15, дебљине 0,1m, како би се осигурало да висина темеља буде иста у паралелном правцу и смеру попречног пресека.

Темељи

— Бетонски темељ "L" облика мора бити изведен у складу са пројектним димензијама како би издржао напрезање које узрокује предња страна зида и обезбедио довољну носивост.

—Површина темеља мора бити потпуно глатка и нивелисана. Доњу површину првог слоја блокова која је равна поставити равно на темељ. Површина зида од блока мора бити поравната са вертикалном површином унутар предњих зуба "L" темеља.

Испуна

Испуна за арматуру састоји се од мешавине 0/63 шљунка и песка. Испуна треба да буде добре градације (C_U>6) и постављена испод и изнад геомреже. Дебљина слоја за сабијање треба да буде 22cm како би се осигурало најбоље пријањање између насипа и геомреже. E_{v2} треба да буде једнак 45MN/m^2 у прва 2 метра висине насипа, а степен сабијања између трећег метра насипа и врха насипа треба најмање да задовољава E_{v2}=60MN/m^2.

Део насипа на удаљености од 1,5 метра од зида треба сабијати лакшим ваљком и вибро плочама, а избегавати употребу тешких вибратора како би се избегла деформација чела зида.

Понављати поступак док се не постигне жељена висина горњег дела зида.

Геомрежа

— Гео-мреже достављају се на градилиште у ролнама, минимална ширина геомреже не треба да буде мања од 1,00m.

— Сила која делује на геомрежу у подужном правцу мора бити управна у односу на зид. Геомрежа постављена дуж правца потпорног зида морају бити међусобно повезане.

Дренажа

Дренажни слој поставља се иза зида бетонског блока. За материјал се узима шљунак, пречника 16/32 и дебљине 0,5m. Између дренажног слоја и испуне насипа поставља се неткани слој геотекстилног филтера (300g/m^2). Тло испред зида мора да има нагиб за одвод не мањи од 5% ка споља, или дренажни систем на траси. Погледајте "Детаљан цртеж" за техничке захтеве постављања.

Круна зида и ограда

Круна зида је израђена од бетона класе C30/37, V-I и *XF3*. Технички захтеви за круну зида детаљно су наведени у цртежима.

Због великих промена нивелете врха круне зида на овом делу, на врху круне зида се не постављају ограде. Затворена ограда пруге постављена је на бочној косини насипа изнад врха зида. За конкретне захтеве у погледу пројекта, погледати цртеже доњег строја 2/2.

Изградња бетонских блокова

Изградња свих конструкција од армиране земље изводи се у слојевима и фазама. Израда зида од армиране земље треба изводити наизменично затрпавањем тла, равнањем, нивелисањем и сабијањем. Ако нивелета темеља конструкције од армиране земље није једнака, радове обично треба започети од најнижег дела темеља.

Радове треба изводити у складу са захтевима EN 14475. У наставку је дат поступак изградње:

Корак 1. Поставите први слој блокова, обраћајући посебну пажњу на уздужно поравнање блокова тако да горња страна буде потпуно равна.

Корак 2. На задњој страни зида поставља се дренажни слој шљунка дебљине 50cm. Неткани геотекстил од 300g/m2 поставља се између слоја шљунка и материјала за испуну као филтрациони слој.

Корак 3. Урадити први слој затрпавања дебљине 22cm. На месту близу зида у кругу од 1,50m, користити мали ваљак или ручне вибро плоче за сабијање испуне. За сабијање испуне преко 1,50m може се користити тежи ваљкасти компактор.

Корак 4. Исећи геомрежу на потребну дужину према цртежу (L+0.3m, где је L ефективна дужина

између два ребра), а затим поставити геомрежу у V-жлеб бетонског блока и повезати са блоком помоћу посебног пластичног конектора.

Корак 5. Поставите други и трећи слој блокова на први слој, уметнути доњи језичак доње површине у жлеб горње површине, обраћајући посебну пажњу на његово уздужно поравнање како би горња страна била потпуно равна.

Осигурати да други слој блокова буде притиснут на први слој геомреже, истовремено осигуравајући да је конектор закључан и чврсто повезан. Затегнути геомрежу хоризонтално уназад да не би дошло до опуштања или деформације.

Корак 6. Напунити и сабити други слој испуне дебљине 44cm. Сабити у два слоја (сваки слој 22cm) до врха трећег блока.

Корак 7. Исећи други слој арматуре геомреже на унапред одређену дужину према величини на цртежу и поновити 4. корак.

Корак 8. Наставити понављање претходних корака постављањем блокова и геомрежа у исправне положаје док се не достигне пројектована висина и заврши изградња зида.

Конкретни захтеви

Бетон који се користи за потпорни зид од армиране земље мора да испуњава следеће захтеве:

— За тампон (тампонски слој) темеља, бетон треба да буде минимумн C30/37, водоотпорност V-I и отпорност на смрзавање *XF3*.

— За декоративну фасаду (блокове) користити префабриковане комаде. Бетон треба да буде минимум C30/37, отпорност на воду V-I и отпорност на смрзавање *XF3*.

Belgrade, April 2021

Responsible Design Engineer:

Зоран Луковић, дипл.грађ.инж

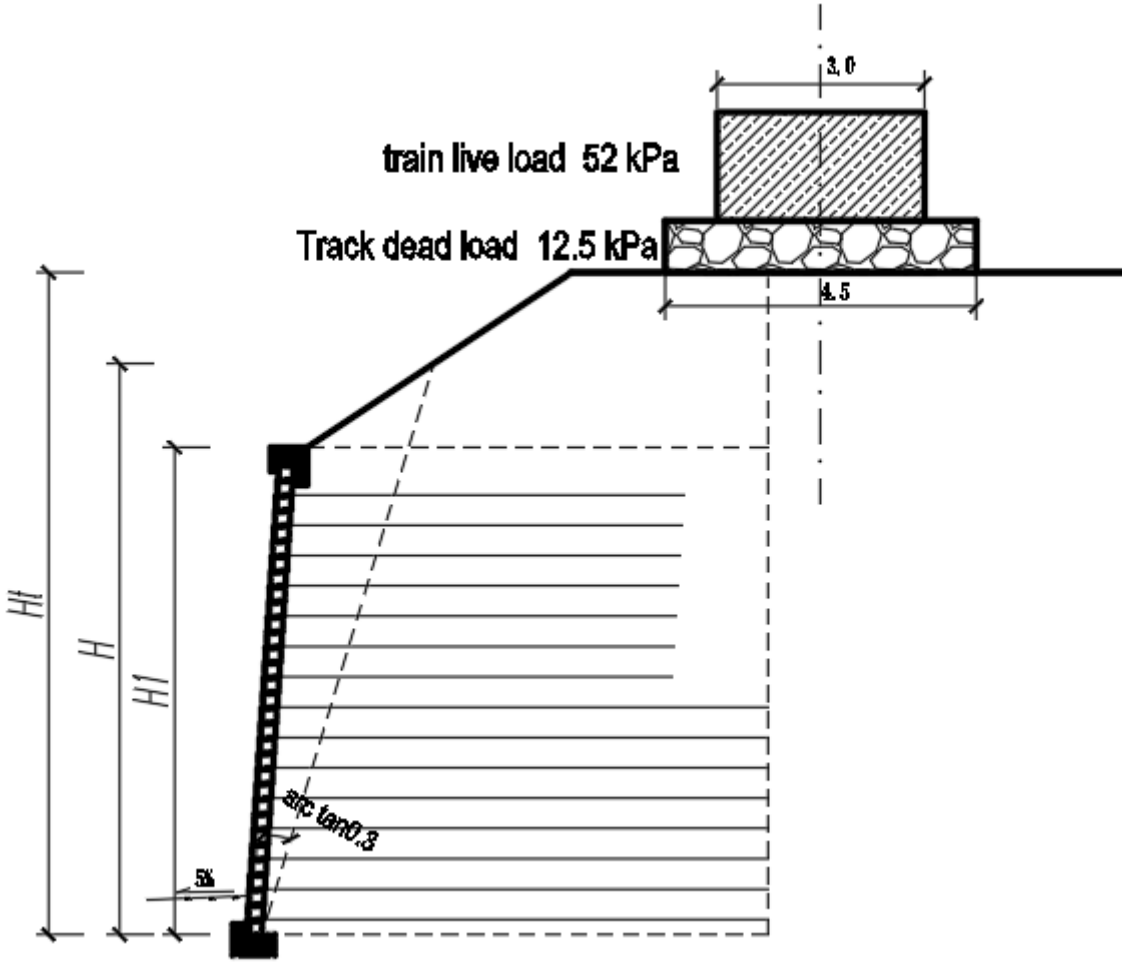
license No.: 310 3032 03

2/4.2.6 НУМЕРИЧКА ДОКУМЕНТАЦИЈА

2/4.2.6.1 Анализа конструкције

2/4.2.6.1 Анализа конструкције

Геометрија конструкције и модел оптерећења



Belgrade, April 2021

Responsible Design Engineer:
Зоран Луковић, дипл.грађ.инж
лиценца број: / license No.: 310 3032 03

_____

AASHTO 2007 (LRFD)
VK1-km0+800（Combination A）

PROJECT IDENTIFICATION

Title: VK1-km0+800（Combination A）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+800（Combination A）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, Ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.4146 (if batter is less than 10°Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3970 Kae (Kh = 0) = 0.3737 Δ Kae = 0.0233 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

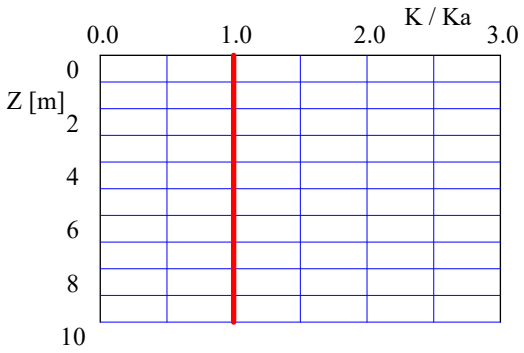
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

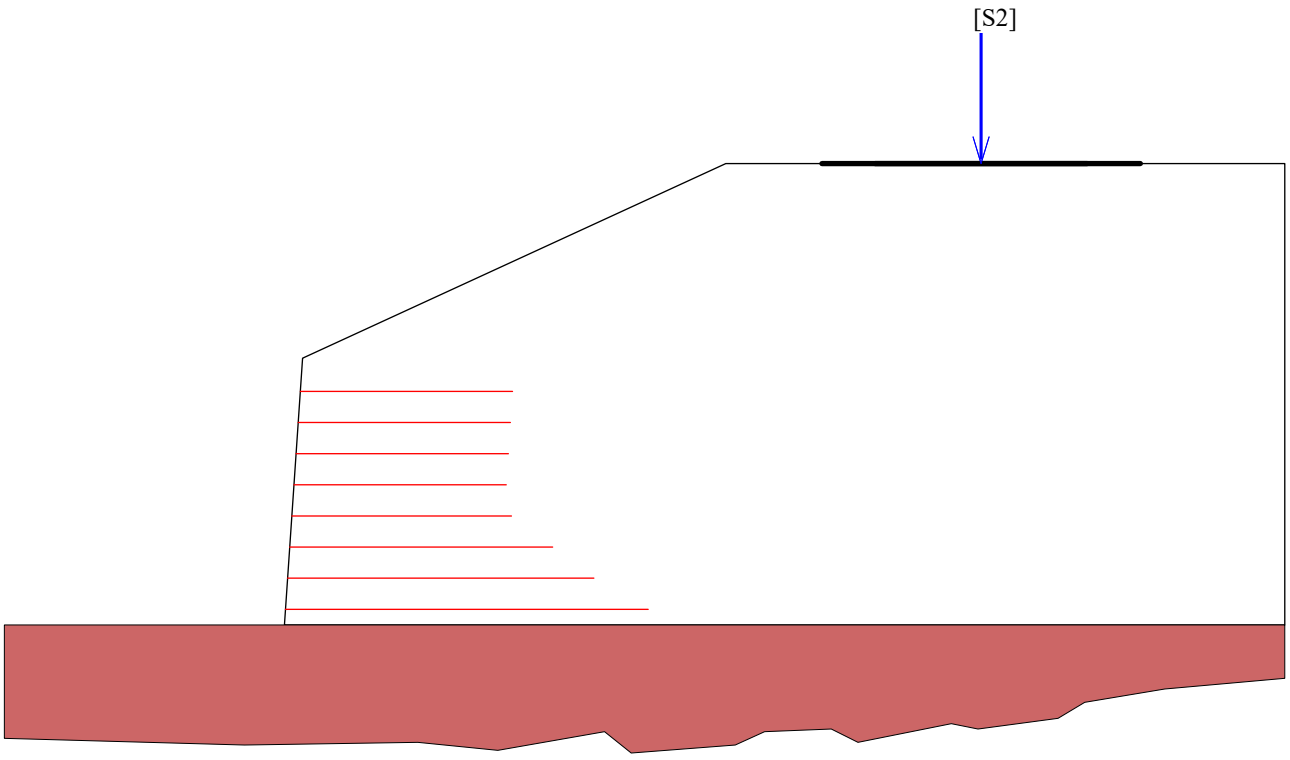
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	3.77	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 3.77 m }
Batter, ω	3.9	[deg]	
Backslope, β	24.7	[deg]	
Backslope rise	2.8	[m]	Broken back equivalent angle, I = 20.04° (see Fig. 25 in DEMO 82)

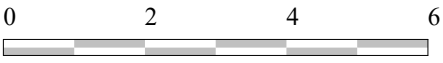
U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 9.6 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 9.6 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.50
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.50
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.50

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77	0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static	Combined Static/Seismic	
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.40
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.50

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	0.83	0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77	0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:	Static	Combined Static/Seismic
ϕ_b	0.74	0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 3.90, Meyerhof stress = 154.16 kPa.

Foundation Interface: Direct sliding, CDR = 1.761, Eccentricity, e/L = 0.0047, CDR-overturning = 6.11

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	5.13	1	N/A	N/A	N/A	1.919	15.409	1.569	-0.0010	---RW-95
2	0.66	4.33	1	N/A	N/A	N/A	2.147	12.083	1.582	0.0027	---RW-95
3	1.10	3.72	1	N/A	N/A	N/A	2.435	9.515	1.582	0.0027	---RW-95
4	1.54	3.10	1	N/A	N/A	N/A	2.812	6.974	1.582	0.0027	---RW-95
5	1.98	3.00	1	N/A	N/A	N/A	3.329	6.221	1.706	-0.0139	---RW-95
6	2.42	3.00	1	N/A	N/A	N/A	4.077	5.867	1.881	-0.0346	---RW-95
7	2.86	3.00	1	N/A	N/A	N/A	5.260	5.588	2.083	-0.0586	---RW-95
8	3.30	3.00	1	N/A	N/A	N/A	5.346	3.962	2.298	-0.0918	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, CDR = 6.64, Meyerhof stress = 107.39 kPa.

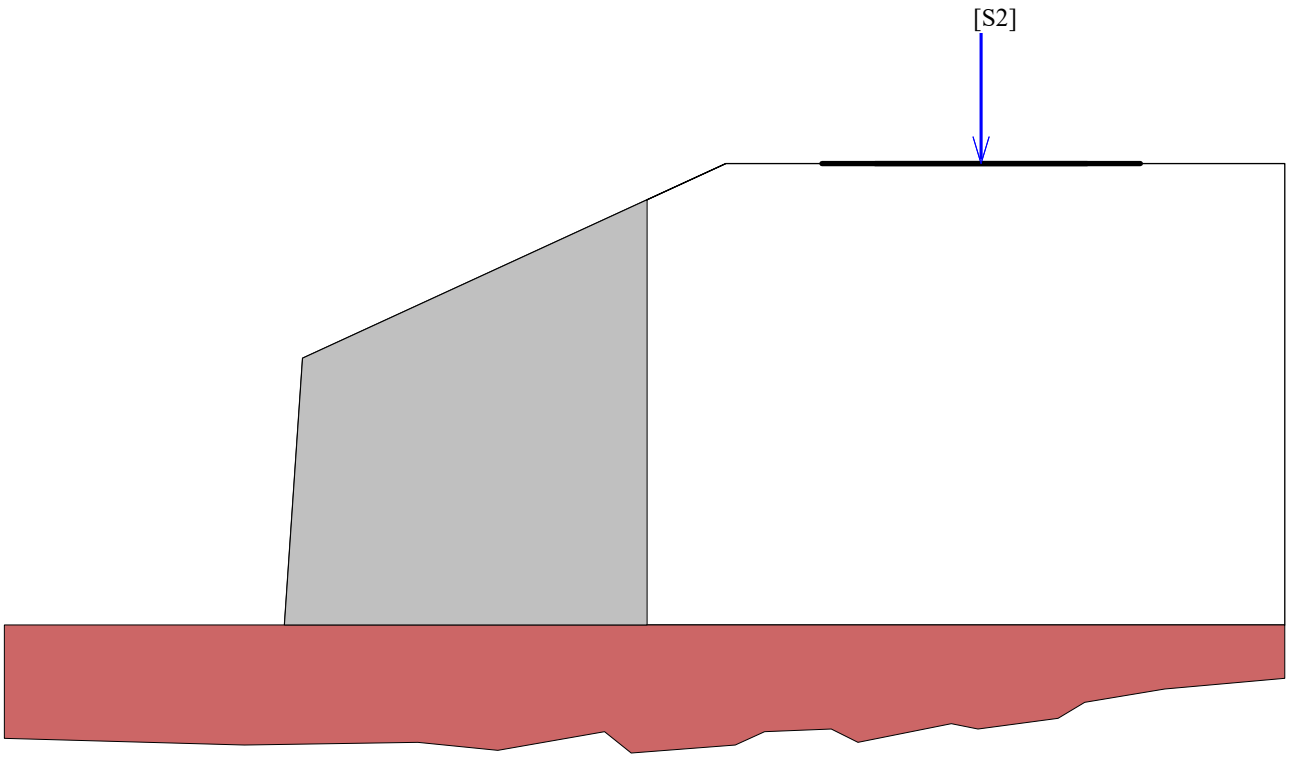
Foundation Interface: Direct sliding, CDR = 1.750, Eccentricity, e/L = 0.0161, Fs-overturning = 5.35

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	5.13	1	N/A	N/A	N/A	1.847	13.247	1.615	0.0092	---RW-95
2	0.66	4.33	1	N/A	N/A	N/A	2.074	10.477	1.637	0.0138	---RW-95
3	1.10	3.72	1	N/A	N/A	N/A	2.360	8.309	1.637	0.0138	---RW-95
4	1.54	3.10	1	N/A	N/A	N/A	2.738	6.148	1.637	0.0138	---RW-95
5	1.98	3.00	1	N/A	N/A	N/A	3.238	5.475	1.780	-0.0060	---RW-95
6	2.42	3.00	1	N/A	N/A	N/A	3.956	5.133	1.983	-0.0298	---RW-95
7	2.86	3.00	1	N/A	N/A	N/A	5.081	4.845	2.226	-0.0561	---RW-95
8	3.30	3.00	1	N/A	N/A	N/A	5.184	3.464	2.491	-0.0909	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	601.8	712.6	[kPa]
Meyerhof stress, σ_V	154.16	107.4	[kPa]
Eccentricity, e	0.02	0.11	[m]
Eccentricity, e/L	0.005	0.021	
CDR calculated	3.90	6.64	
Base length	5.13	5.13	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 1.761 and CDR-seismic = 1.750

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	5.13	1.569	1.615	1	---RW-95
2	0.66	4.33	1.582	1.637	1	---RW-95
3	1.10	3.72	1.582	1.637	1	---RW-95
4	1.54	3.10	1.582	1.637	1	---RW-95
5	1.98	3.00	1.706	1.780	1	---RW-95
6	2.42	3.00	1.881	1.983	1	---RW-95
7	2.86	3.00	2.083	2.226	1	---RW-95
8	3.30	3.00	2.298	2.491	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0047, e/L seismic = 0.0161; Overturning: CDR-static = 6.11, CDR-seismic = 5.35

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	5.13	-0.0010	0.0092	1	---RW-95
2	0.66	4.33	0.0027	0.0138	1	---RW-95
3	1.10	3.72	0.0027	0.0138	1	---RW-95
4	1.54	3.10	0.0027	0.0138	1	---RW-95
5	1.98	3.00	-0.0139	-0.0060	1	---RW-95
6	2.42	3.00	-0.0346	-0.0298	1	---RW-95
7	2.86	3.00	-0.0586	-0.0561	1	---RW-95
8	3.30	3.00	-0.0918	-0.0909	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	15.77	1.38	N/A	1.919	N/A	1.847	---RW-95
2	0.66	30.3	14.10	1.11	N/A	2.147	N/A	2.074	---RW-95
3	1.10	30.3	12.43	0.88	N/A	2.435	N/A	2.360	---RW-95
4	1.54	30.3	10.76	0.65	N/A	2.812	N/A	2.738	---RW-95
5	1.98	30.3	9.09	0.57	N/A	3.329	N/A	3.238	---RW-95
6	2.42	30.3	7.42	0.51	N/A	4.077	N/A	3.956	---RW-95
7	2.86	30.3	5.75	0.45	N/A	5.260	N/A	5.081	---RW-95
8	3.30	30.3	5.66	0.39	N/A	5.346	N/A	5.184	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	15.77	1.38	5.02	0.10	243.0	N/A	15.409	227.2	N/A	13.247
2	0.66	1.000	14.10	1.11	4.01	0.31	170.4	N/A	12.083	159.3	N/A	10.477
3	1.10	1.000	12.43	0.88	3.19	0.52	118.3	N/A	9.515	110.6	N/A	8.309
4	1.54	1.000	10.76	0.65	2.37	0.73	75.1	N/A	6.974	70.2	N/A	6.148
5	1.98	1.000	9.09	0.57	2.06	0.94	56.6	N/A	6.221	52.9	N/A	5.475
6	2.42	1.000	7.42	0.51	1.85	1.15	43.6	N/A	5.867	40.7	N/A	5.133
7	2.86	1.000	5.75	0.45	1.64	1.36	32.2	N/A	5.588	30.1	N/A	4.845
8	3.30	1.000	5.66	0.39	1.43	1.57	22.4	N/A	3.962	21.0	N/A	3.464

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
VK1-km0+800（Combination B）

PROJECT IDENTIFICATION

Title: VK1-km0+800（Combination B）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

,
Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+800（Combination B）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: DESIGN
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DESIGN DATA

DESIGN OBJECTIVES

Minimum Capacity Demand Ratio in pullout, CDR-po	1.10
Minimum Capacity Demand Ratio in direct sliding, CDR-sliding	1.10
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.2500
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-static	1.30
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 1.00 m.
Prescribed minimum normalized length of each layer is: L/Hd = 0.75 --> L = 2.83 m.
Prescribed minimum absolute total length of each layer is: L = 3.00 m.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L	0.2500
Min. Capacity Demand Ratio with respect to ultimate bearing capacity (Meyerhof approach)	1.10

Bearing capacity coefficients: Nc = 22.25 N γ= 12.54

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ?
Design value of internal angle of friction, ϕ	33.0 ?

RETAINED SOIL

Unit weight, γ	19.5 kN/m ?
Design value of internal angle of friction, ϕ	30.0 ?

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ?
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 ?
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10? Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ= 61.50? (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.4146 (if batter is less than 10? Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3970 Kae (Kh = 0) = 0.3737 Δ Kae = 0.0233 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic CDR is 100.0% of specified static CDR for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

BEARING CAPACITY

Seismic CDR is 100.0% of specified static CDR for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic Capacity Demand Ratio in pullout, CDR-po, is 100.0% of its specified static value.
Seismic Capacity Demand Ratio, CDR-overall, is 100.0% of its specified static value.
The reduction of CDR pertains to geogrid strength and to connection strength for break mode of failure.

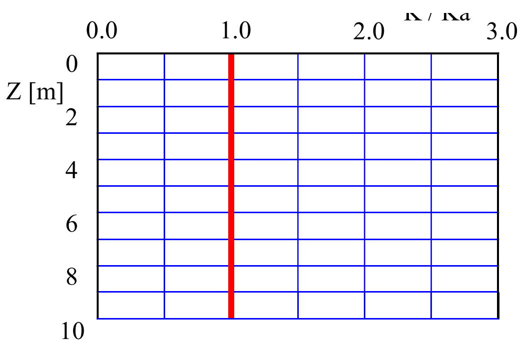
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids
(Multiple type reinforcement)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	1.00	1.00			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67稽aϕ	0.67稽aϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

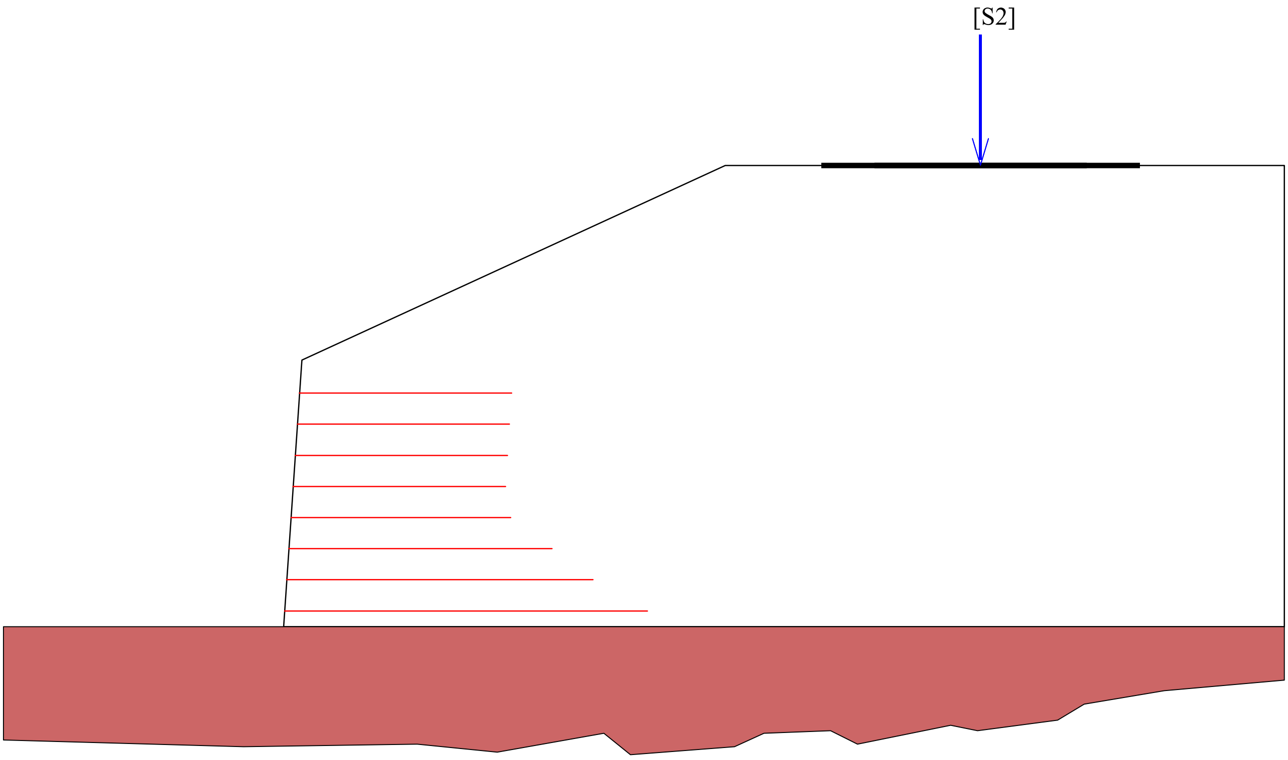
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	3.77	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 3.77 m }
Batter, ω	3.9	[deg]	
Backslope, β	24.7	[deg]	
Backslope rise	2.8	[m]	Broken back equivalent angle, I = 20.04? (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 9.6 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 9.6 [m] @ depth of 0.0 [m] below soil surface.

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

Copyright ?1998-2007 ADAMA Engineering, Inc.
License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00	
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00	
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00	
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00	
Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90
Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90
Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77	0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:

		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.50
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:

		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	0.83	0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77	0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:

	Static	Combined Static/Seismic
ϕ_b	0.74	0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

REINFORCEMENT LAYOUT AND DESIGN CRITERIA

LEGEND:
(1) Connection strength
(2) Geogrid strength
(3) Pullout resistance
(4) Direct sliding
(5) Eccentricity

√ Satisfactory
⊗ Unsatisfactory

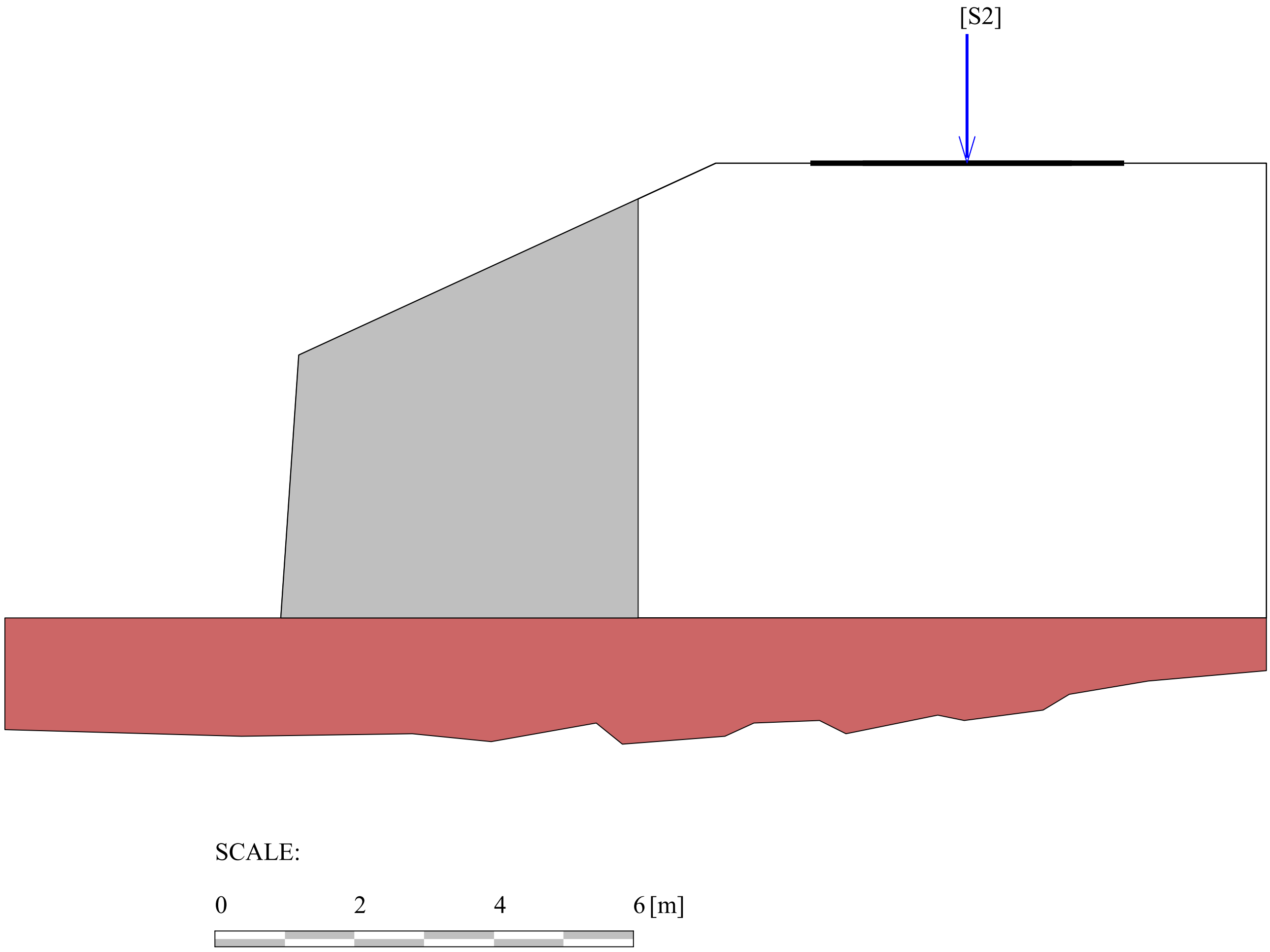
Bearing capacity: √
Foudation Interface: Direct sliding √ Eccentricity √

#	Geogrid Elevation [m]	Length [m]	Type #	(1)	(2)	(3)	(4)	(5)
1	0.22	5.13	1	N/A	√	√	√	√
2	0.66	4.33	1	N/A	√	√	√	√
3	1.10	3.72	1	N/A	√	√	√	√
4	1.54	3.10	1	N/A	√	√	√	√
5	1.98	3.00	1	N/A	√	√	√	√
6	2.42	3.00	1	N/A	√	√	√	√
7	2.86	3.00	1	N/A	√	√	√	√
8	3.30	3.00	1	N/A	√	√	√	√

Copyright ?1998-2007 ADAMA Engineering, Inc.
License number MWRG-301431

BEARING CAPACITY for DESIGNED LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	578.3	720.9	[kPa]
Meyerhof stress, σ_v	112.90	105.6	[kPa]
Eccentricity, e	0.15	0.07	[m]
Eccentricity, e/L	0.029	0.014	
CDR calculated	5.12	6.83	
Base length	5.13	5.13	[m]



Copyright ?1998-2007 ADAMA Engineering, Inc.
License number MWRG-301431

DIRECT SLIDING for DESIGNED LAYOUT
(for GEOGRID reinforcements)

Specified CDR-static = 1.100 and CDR-seismic = 1.100

Along reinforced and foundation soils interface: CDR-static = 1.289 and CDR-seismic = 1.806

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	5.13	1.101	1.662	1	---RW-95
2	0.66	4.33	1.101	1.669	1	---RW-95
3	1.10	3.72	1.101	1.669	1	---RW-95
4	1.54	3.10	1.101	1.669	1	---RW-95
5	1.98	3.00	1.184	1.810	1	---RW-95
6	2.42	3.00	1.301	2.009	1	---RW-95
7	2.86	3.00	1.435	2.244	1	---RW-95
8	3.30	3.00	1.579	2.500	1	---RW-95

ECCENTRICITY for DESIGNED LAYOUT

At interface with foundation: e/L static = 0.0290, e/L seismic = 0.0136; Overturning: CDR-static = 4.40, CDR-seismic = 5.49

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	5.13	0.0213	0.0070	1	---RW-95
2	0.66	4.33	0.0262	0.0113	1	---RW-95
3	1.10	3.72	0.0262	0.0113	1	---RW-95
4	1.54	3.10	0.0262	0.0113	1	---RW-95
5	1.98	3.00	0.0044	-0.0077	1	---RW-95
6	2.42	3.00	-0.0219	-0.0308	1	---RW-95
7	2.86	3.00	-0.0505	-0.0565	1	---RW-95
8	3.30	3.00	-0.0874	-0.0910	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	10.5	1.4	1.000	2.879	1.000	2.719	---RW-95
2	0.66	30.3	9.4	1.1	1.000	3.220	1.000	3.059	---RW-95
3	1.10	30.3	8.3	0.9	1.000	3.652	1.000	3.486	---RW-95
4	1.54	30.3	7.2	0.7	1.000	4.219	1.000	4.053	---RW-95
5	1.98	30.3	6.1	0.6	1.000	4.993	1.000	4.792	---RW-95
6	2.42	30.3	4.9	0.5	1.000	6.116	1.000	5.846	---RW-95
7	2.86	30.3	3.8	0.5	1.000	7.891	1.000	7.494	---RW-95
8	3.30	30.3	3.8	0.4	1.000	8.019	1.000	7.660	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	10.51	1.38	5.02	0.10	243.0	1.100	23.114	227.2	1.100	19.101
2	0.66	1.000	9.40	1.11	4.01	0.31	170.4	1.100	18.125	159.3	1.100	15.164
3	1.10	1.000	8.29	0.88	3.19	0.52	118.3	1.100	14.272	110.6	1.100	12.065
4	1.54	1.000	7.17	0.65	2.37	0.73	75.1	1.100	10.461	70.2	1.100	8.966
5	1.98	1.000	6.06	0.57	2.06	0.94	56.6	1.100	9.331	52.9	1.100	7.978
6	2.42	1.000	4.95	0.51	1.85	1.15	43.6	1.100	8.800	40.7	1.100	7.461
7	2.86	1.000	3.84	0.45	1.64	1.36	32.2	1.100	8.383	30.1	1.100	7.012
8	3.30	1.000	3.77	0.39	1.43	1.57	22.4	1.100	5.943	21.0	1.100	5.031

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
KV1-km0+800（Combination C）

PROJECT IDENTIFICATION

Title: KV1-km0+800（Combination C）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+800（Combination C）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL
Unit weight, γ 19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ 33.0 °

RETAINED SOIL
Unit weight, γ 19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ 30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)
Equivalent unit weight, $\gamma_{equiv.}$ 20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$ 26.0 °
Equivalent cohesion, $c_{equiv.}$ 7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, Ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.4146 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3970 Kae (Kh = 0) = 0.3737 Δ Kae = 0.0233 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

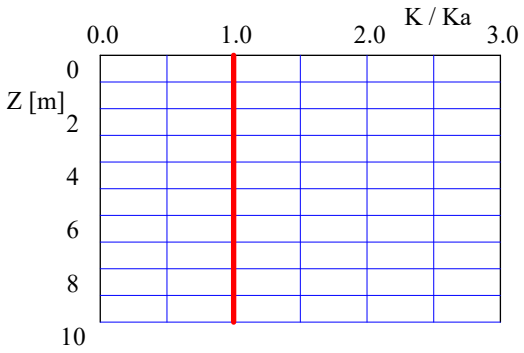
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

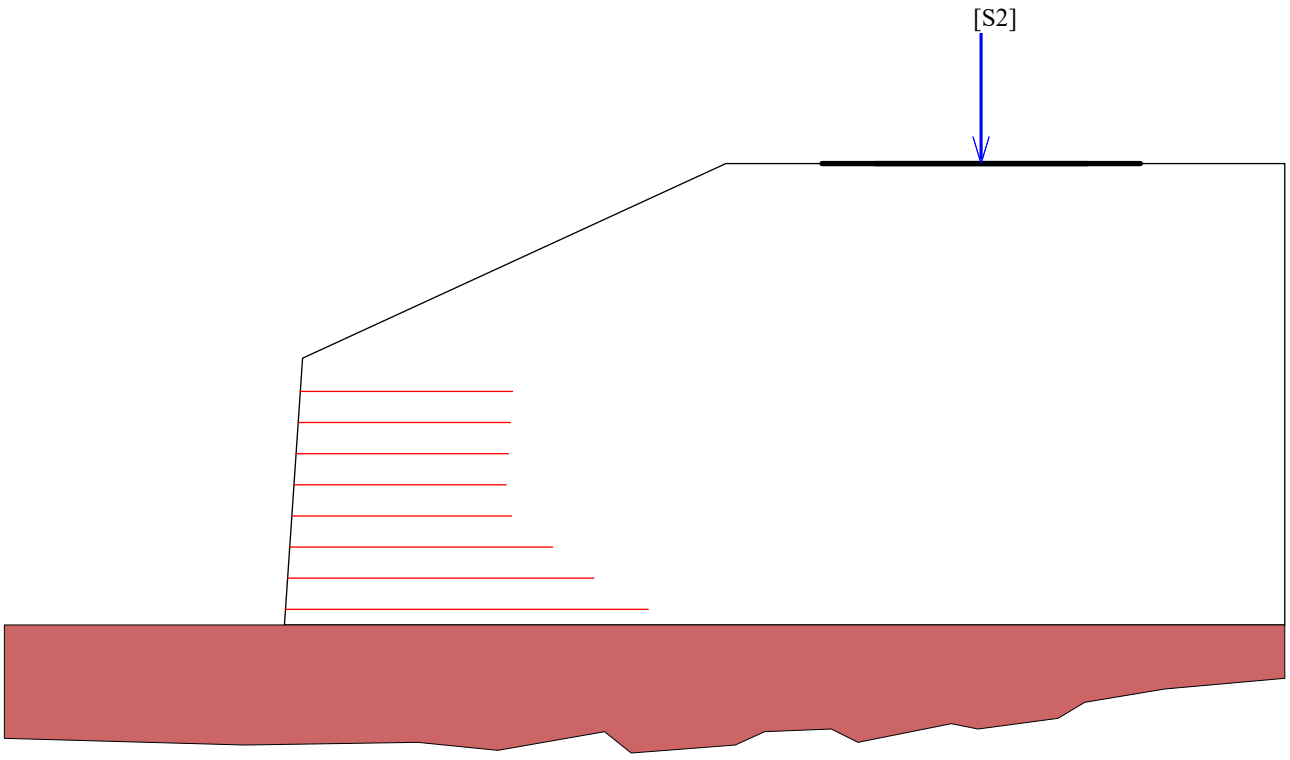
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	3.77	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 3.77 m }
Batter, ω	3.9	[deg]	
Backslope, β	24.7	[deg]	
Backslope rise	2.8	[m]	Broken back equivalent angle, I = 20.04° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 9.6 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 9.6 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00	
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00	
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00	
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00	
Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00
Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00
Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	1.00	1.00

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.00
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_{τ}	1.00	1.00
Reinforced Soil and Reinforcement	ϕ_{τ}	1.00	1.00
Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
	ϕ_b	1.00	1.00

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 7.76, Meyerhof stress = 104.19 kPa.
Foundation Interface: Direct sliding, CDR = 2.087, Eccentricity, e/L = 0.0083, CDR-overturning = 5.77

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	5.13	1	N/A	N/A	N/A	2.879	30.018	1.917	0.0023	---RW-95
2	0.66	4.33	1	N/A	N/A	N/A	3.220	23.538	1.929	0.0062	---RW-95
3	1.10	3.72	1	N/A	N/A	N/A	3.652	18.536	1.929	0.0062	---RW-95
4	1.54	3.10	1	N/A	N/A	N/A	4.219	13.586	1.929	0.0062	---RW-95
5	1.98	3.00	1	N/A	N/A	N/A	4.993	12.118	2.080	-0.0112	---RW-95
6	2.42	3.00	1	N/A	N/A	N/A	6.116	11.429	2.292	-0.0327	---RW-95
7	2.86	3.00	1	N/A	N/A	N/A	7.891	10.887	2.536	-0.0574	---RW-95
8	3.30	3.00	1	N/A	N/A	N/A	8.019	7.719	2.797	-0.0912	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

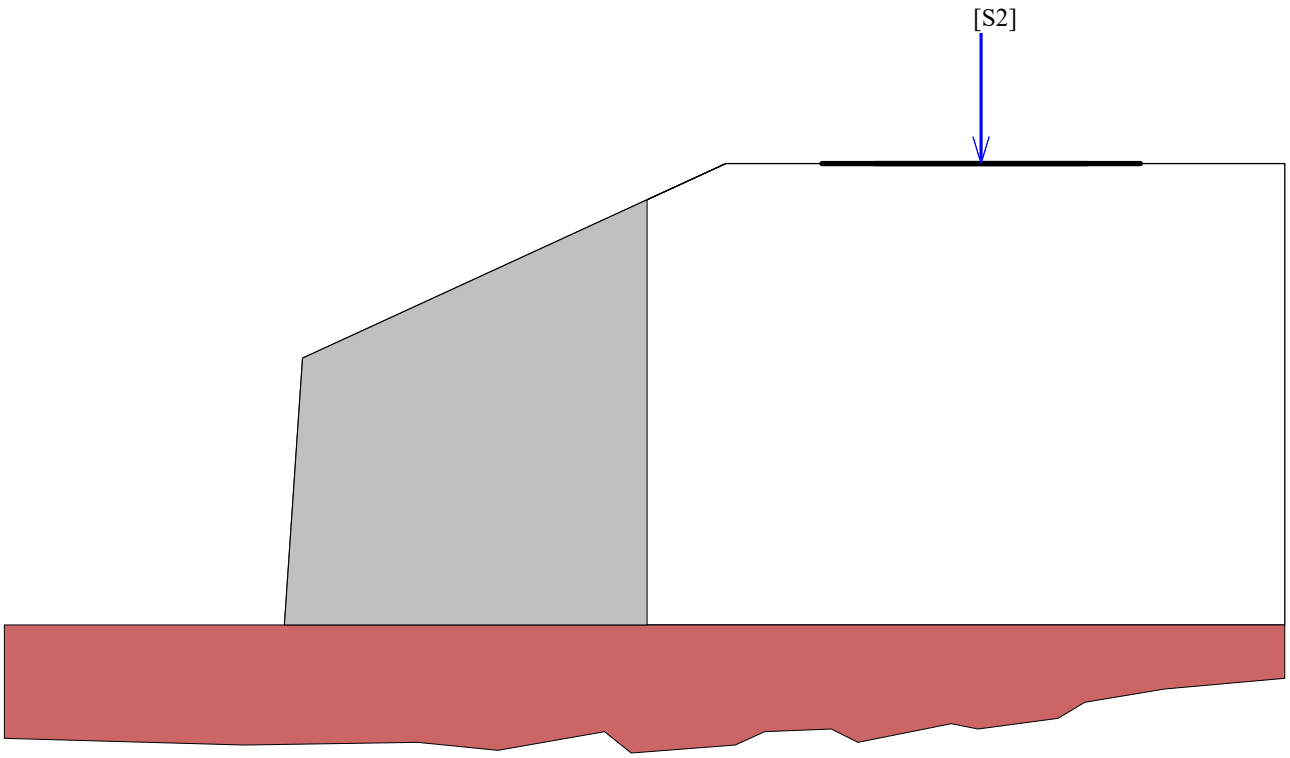
Bearing capacity, CDR = 7.59, Meyerhof stress = 105.60 kPa.
Foundation Interface: Direct sliding, CDR = 2.006, Eccentricity, e/L = 0.0136, Fs-overturning = 5.49

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	5.13	1	N/A	N/A	N/A	3.021	21.223	1.846	0.0070	---RW-95
2	0.66	4.33	1	N/A	N/A	N/A	3.398	16.849	1.854	0.0113	---RW-95
3	1.10	3.72	1	N/A	N/A	N/A	3.874	13.406	1.854	0.0113	---RW-95
4	1.54	3.10	1	N/A	N/A	N/A	4.504	9.962	1.854	0.0113	---RW-95
5	1.98	3.00	1	N/A	N/A	N/A	5.325	8.865	2.011	-0.0077	---RW-95
6	2.42	3.00	1	N/A	N/A	N/A	6.496	8.290	2.232	-0.0308	---RW-95
7	2.86	3.00	1	N/A	N/A	N/A	8.327	7.791	2.494	-0.0565	---RW-95
8	3.30	3.00	1	N/A	N/A	N/A	8.511	5.590	2.778	-0.0910	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	808.5	801.0	[kPa]
Meyerhof stress, σ_V	104.19	105.6	[kPa]
Eccentricity, e	0.04	0.07	[m]
Eccentricity, e/L	0.008	0.014	
CDR calculated	7.76	7.59	
Base length	5.13	5.13	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 2.087 and CDR-seismic = 2.006

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	5.13	1.917	1.846	1	---RW-95
2	0.66	4.33	1.929	1.854	1	---RW-95
3	1.10	3.72	1.929	1.854	1	---RW-95
4	1.54	3.10	1.929	1.854	1	---RW-95
5	1.98	3.00	2.080	2.011	1	---RW-95
6	2.42	3.00	2.292	2.232	1	---RW-95
7	2.86	3.00	2.536	2.494	1	---RW-95
8	3.30	3.00	2.797	2.778	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0083, e/L seismic = 0.0136; Overturning: CDR-static = 5.77, CDR-seismic = 5.49

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	5.13	0.0023	0.0070	1	---RW-95
2	0.66	4.33	0.0062	0.0113	1	---RW-95
3	1.10	3.72	0.0062	0.0113	1	---RW-95
4	1.54	3.10	0.0062	0.0113	1	---RW-95
5	1.98	3.00	-0.0112	-0.0077	1	---RW-95
6	2.42	3.00	-0.0327	-0.0308	1	---RW-95
7	2.86	3.00	-0.0574	-0.0565	1	---RW-95
8	3.30	3.00	-0.0912	-0.0910	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	10.51	1.38	N/A	2.879	N/A	3.021	---RW-95
2	0.66	30.3	9.40	1.11	N/A	3.220	N/A	3.398	---RW-95
3	1.10	30.3	8.29	0.88	N/A	3.652	N/A	3.874	---RW-95
4	1.54	30.3	7.17	0.65	N/A	4.219	N/A	4.504	---RW-95
5	1.98	30.3	6.06	0.57	N/A	4.993	N/A	5.325	---RW-95
6	2.42	30.3	4.95	0.51	N/A	6.116	N/A	6.496	---RW-95
7	2.86	30.3	3.84	0.45	N/A	7.891	N/A	8.327	---RW-95
8	3.30	30.3	3.77	0.39	N/A	8.019	N/A	8.511	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	10.51	1.38	5.02	0.10	315.6	N/A	30.018	252.5	N/A	21.223
2	0.66	1.000	9.40	1.11	4.01	0.31	221.3	N/A	23.538	177.0	N/A	16.849
3	1.10	1.000	8.29	0.88	3.19	0.52	153.6	N/A	18.536	122.9	N/A	13.406
4	1.54	1.000	7.17	0.65	2.37	0.73	97.5	N/A	13.586	78.0	N/A	9.962
5	1.98	1.000	6.06	0.57	2.06	0.94	73.5	N/A	12.118	58.8	N/A	8.865
6	2.42	1.000	4.95	0.51	1.85	1.15	56.6	N/A	11.429	45.3	N/A	8.290
7	2.86	1.000	3.84	0.45	1.64	1.36	41.8	N/A	10.887	33.4	N/A	7.791
8	3.30	1.000	3.77	0.39	1.43	1.57	29.1	N/A	7.719	23.3	N/A	5.590

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

km0+800 overall stability(no seismicity)

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title: km0+800 overall stability(no seismicity)
Project Number: -
Client:
Designer: 戴征杰（BOSTD）

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\D ..... op\2021\KV1-km0+800 overall stability analysis.MSE
Original date and time of creating this file: Fri Mar 26 14:22:42 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m 3	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
1....... Reinforced Soil.................................	19.5	33.0	0.0
2....... Retained Soil.....................................	19.5	30.0	0.0
3....... Foundation Soil.................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

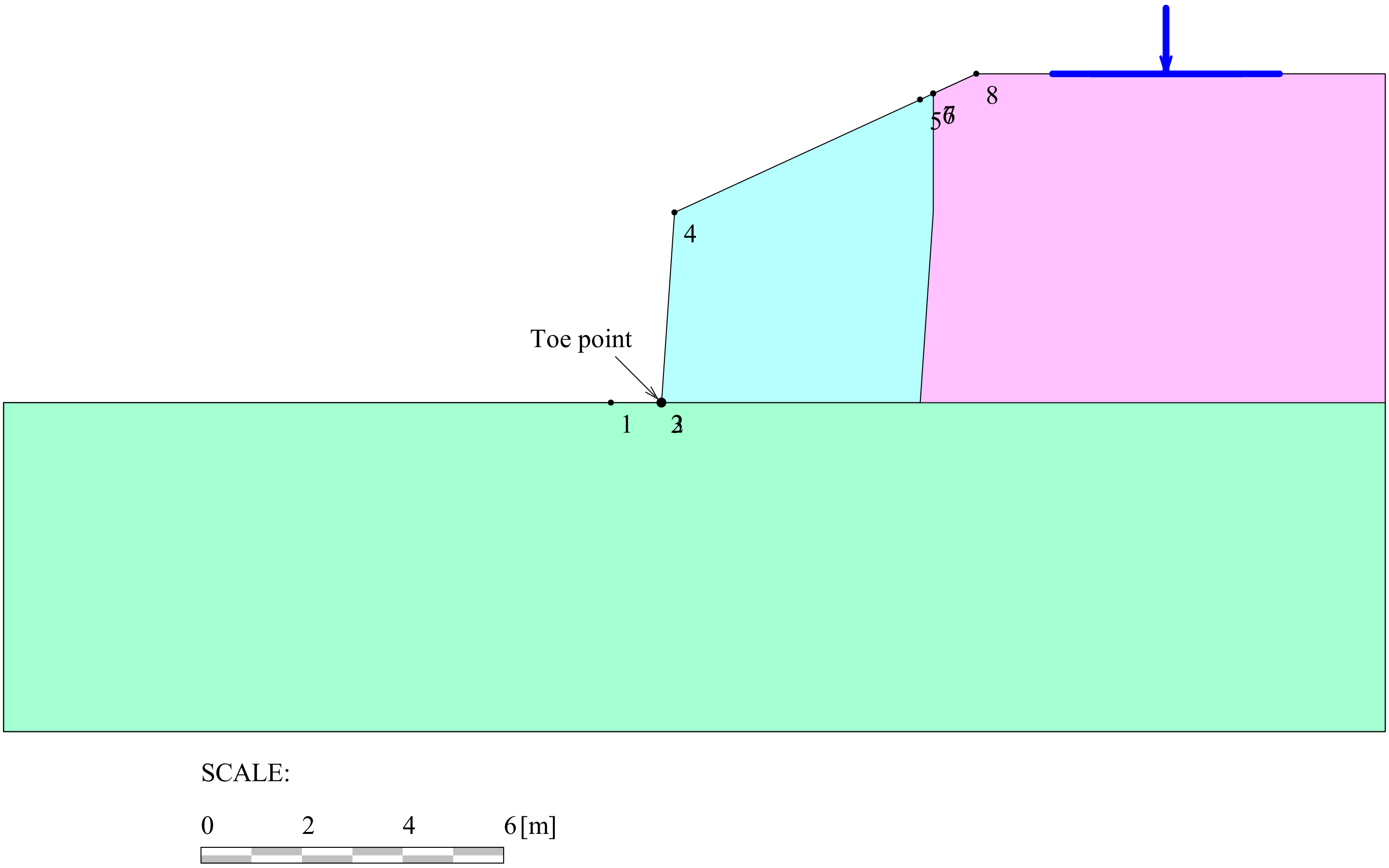
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1....................................None
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

Strip Load #1.. 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 10.00 [m]
Strip Load #2.. 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 10.00 [m]



Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.26	3.77
	5	6.24	6.52
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	5.13	0.00
	10	5.39	3.77
	11	5.39	6.13
	12	6.24	6.52
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

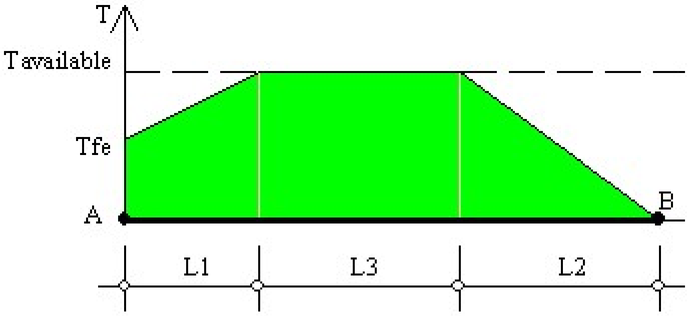
#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.26	3.77	0.00	0.00
5	5.13	6.01	0.00	0.00
6	5.39	6.13	3.77	0.00
7	5.39	6.13	6.13	0.00
8	6.24	6.52	6.52	0.00

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---RW-95	0.22	5.13	0.00	0.66	4.47	33.63	33.63
2	---RW-95	0.66	4.33	0.00	0.78	3.55	33.63	33.63
3	---RW-95	1.10	3.72	0.00	0.91	2.81	33.63	33.63
4	---RW-95	1.54	3.10	0.00	1.12	1.98	33.63	33.63
5	---RW-95	1.98	3.00	0.00	1.33	1.67	33.63	33.63
6	---RW-95	2.42	3.00	0.00	1.61	1.39	33.63	33.63
7	---RW-95	2.86	3.00	0.00	2.10	0.90	33.63	33.63
8	---RW-95	3.30	3.00	0.00	3.00	0.00	30.93	30.93 (*)

(*) This Tavailable is dictated by the pullout resistance capacity, which is smaller than the long-term strength of the reinforcement that is related to its specified ultimate strength.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	5.80	6.32	-5.36	0.04	-1.59	6.40	7.39	2.05	
2	6.72	6.52	-4.62	0.00	-0.84	6.55	7.56	1.78	
3	7.64	6.52	-4.08	0.06	-0.33	7.12	7.99	1.63	
4	8.56	6.52	-4.01	0.03	0.38	6.95	8.19	1.58	
5	9.48	6.52	-3.96	0.00	0.38	8.16	9.25	1.45	
6	10.40	6.52	-4.07	0.05	0.43	9.41	10.38	1.38	
. 7	11.32	6.52	-4.01	0.02	0.32	11.14	11.94	1.35 .	OK
8	12.24	6.52	-5.43	0.05	-0.35	13.55	14.42	1.40	
9	13.16	6.52	-5.36	0.02	-0.31	15.29	16.07	1.49	
10	14.08	6.52	-5.98	0.01	-0.58	17.54	18.34	1.58	
11	15.00	6.52	-6.12	0.05	-0.43	19.20	19.98	1.68	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

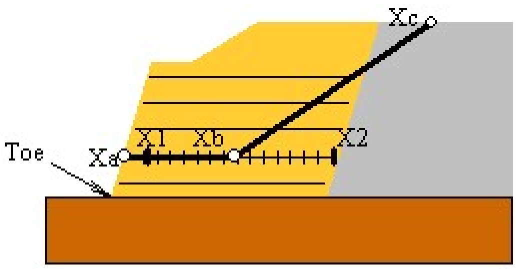
Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-6.73	0.06	11.32	6.52	-0.90	12.22	13.49	1.38	
2	-6.03	0.04	11.32	6.52	-0.60	11.98	13.12	1.37	
3	-5.31	0.01	11.32	6.52	-0.19	11.43	12.51	1.36	
4	-4.76	0.06	11.32	6.52	0.00	11.44	12.34	1.35	
. 5	-4.01	0.02	11.32	6.52	0.32	11.14	11.94	1.35 .	OK
6	-3.42	0.04	11.32	6.52	0.64	10.82	11.52	1.36	
7	-2.80	0.06	11.32	6.52	0.97	10.48	11.08	1.37	
8	-2.00	0.01	11.32	6.52	1.31	10.12	10.64	1.38	
9	-1.33	0.00	11.32	6.52	1.66	9.74	10.19	1.41	
10	-0.70	0.00	11.32	6.52	0.22	12.64	12.67	1.43	
11	-0.00	0.00	11.32	6.52	0.43	12.34	12.35	1.44	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
At toe elevation	0.00	0.00	0.00	0.20	0.00	10.24	6.52	1.38	Minimum on Edge
Reinf. Layer #1	0.22	0.02	0.22	2.10	0.22	11.09	6.52	1.42	OK
Reinf. Layer #2	0.66	0.05	0.66	4.29	0.66	11.53	6.52	1.38	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	3.79	1.10	10.98	6.52	1.37	Minimum on Edge
. Reinf. Layer #4	1.54	0.11	1.54	3.19	1.54	10.30	6.52	1.37	Minimum on Edge
Reinf. Layer #5	1.98	0.14	1.98	3.09	1.98	10.08	6.52	1.40	Minimum on Edge
Reinf. Layer #6	2.42	0.17	2.42	3.19	2.42	9.75	6.52	1.45	Minimum on Edge
Reinf. Layer #7	2.86	0.20	2.86	3.19	2.86	9.53	6.52	1.51	Minimum on Edge
Reinf. Layer #8	3.30	0.23	3.30	3.19	3.30	8.77	6.52	1.59	Minimum on Edge

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.35

Critical Circle: Xc = 0.32[m], Yc = 11.14[m], R = 11.94[m]. (Number of slices used = 57)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

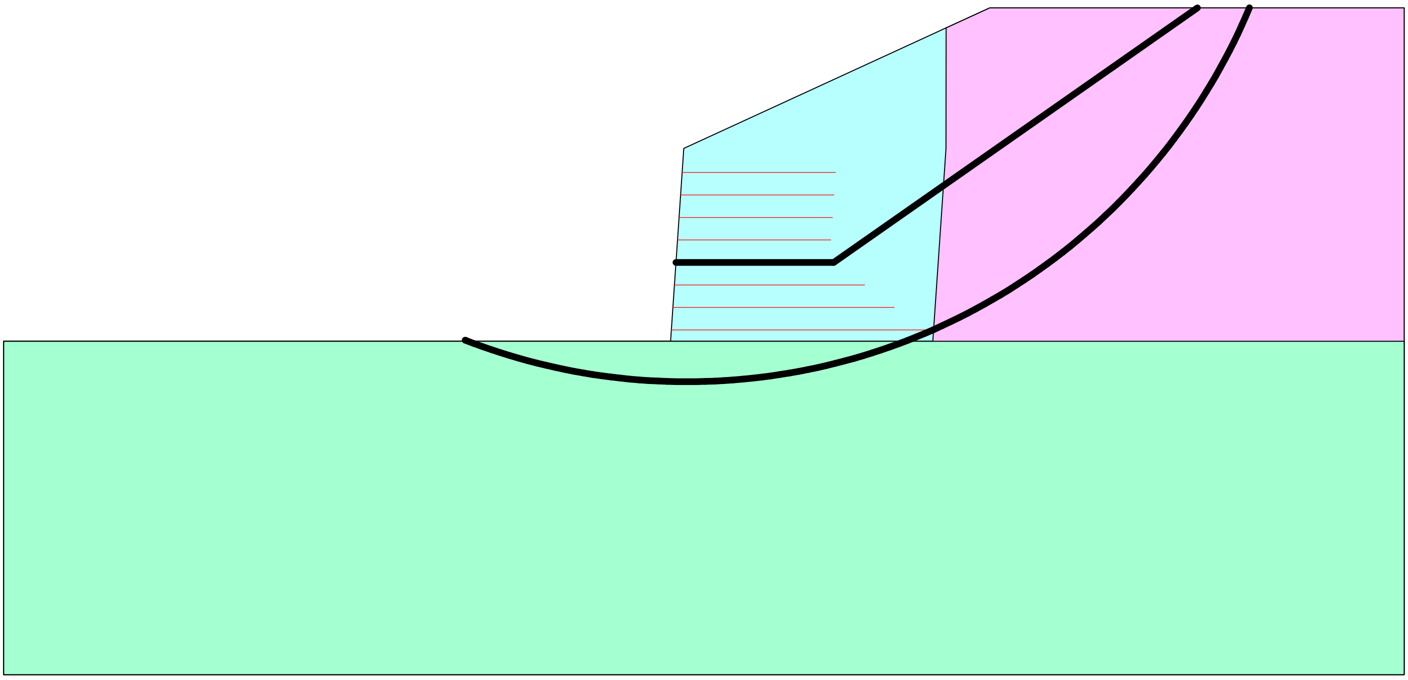
Minimum Factor of Safety = 1.37

Critical Two-Part Wedge: (Xa = 0.11, Ya = 1.54) [m]
(Xb = 3.19, Yb = 1.54) [m]
(Xc = 10.30, Yc = 6.52) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 27.26 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



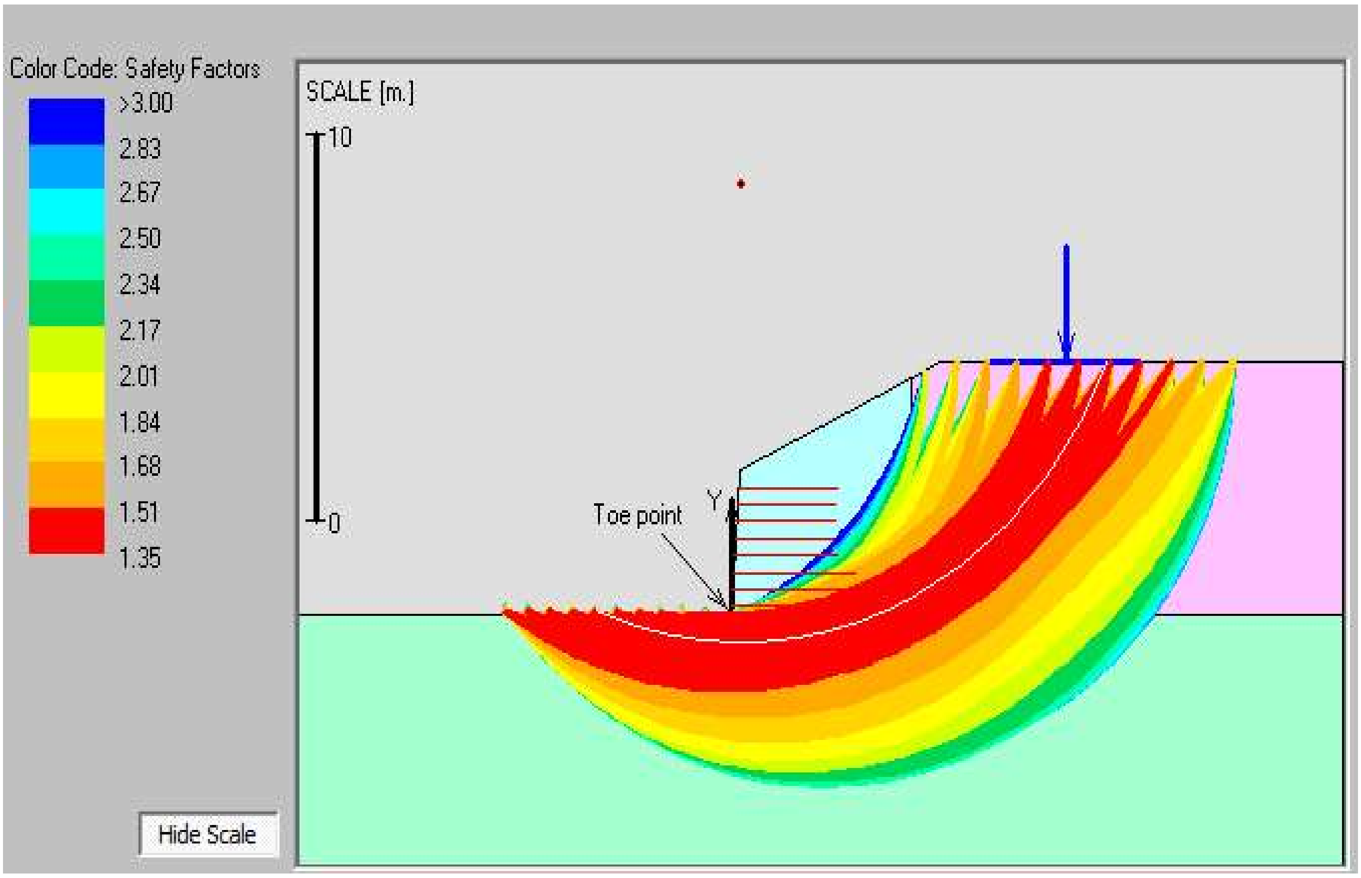
SCALE:

0 2 4 6[m]

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

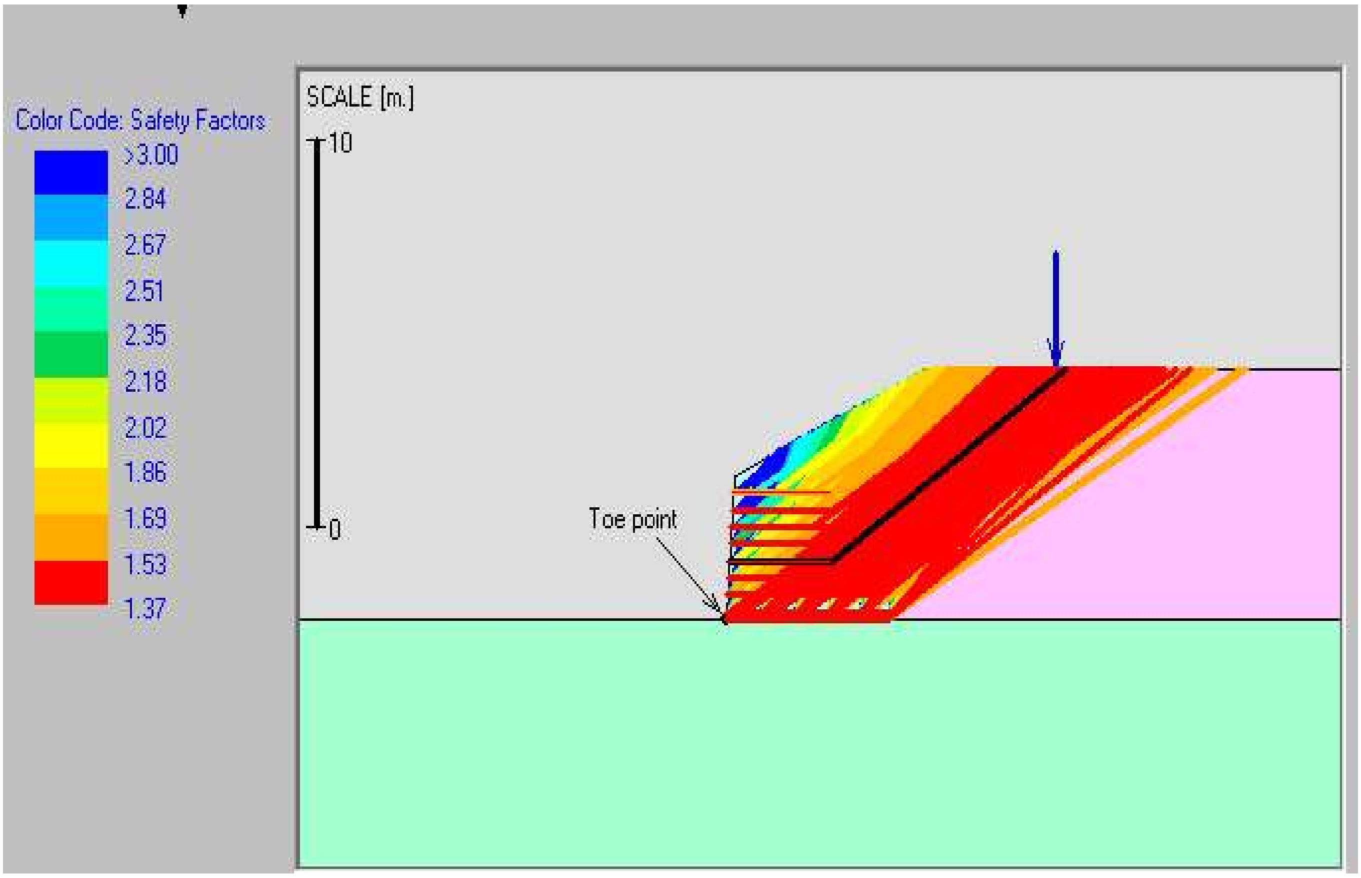
SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

km0+800 overall stability(seismicity)

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title:	km0+800 overall stability(seismicity)
Project Number:	-
Client:	
Designer:	戴征杰（BOSTD）

Description:

Company's information:

Name:	China Railway Design Corporation Serbia Ogranak Beogrda
Street:	Koste Racina 16b, 11000 Belgrade, Serbia
Telephone #:	
Fax #:	
E-Mail:	

Original file path and name: C:\Users\D ..... op\2021\KV1-km0+800 overall stability analysis.MSE
Original date and time of creating this file: Fri Mar 26 14:22:42 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m 3	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
.1....... Reinforced Soil.................................	19.5	33.0	0.0
.2....... Retained Soil.....................................	19.5	30.0	0.0
.3....... Foundation Soil.................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Horizontal peak ground acceleration coefficient, Ao = 0.140
Design horizontal seismic coefficient, kh = Am = 0.50 x Ao = 0.070 & design vertical seismic coefficient, kv (down) = 0.000 x kh = 0.000

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

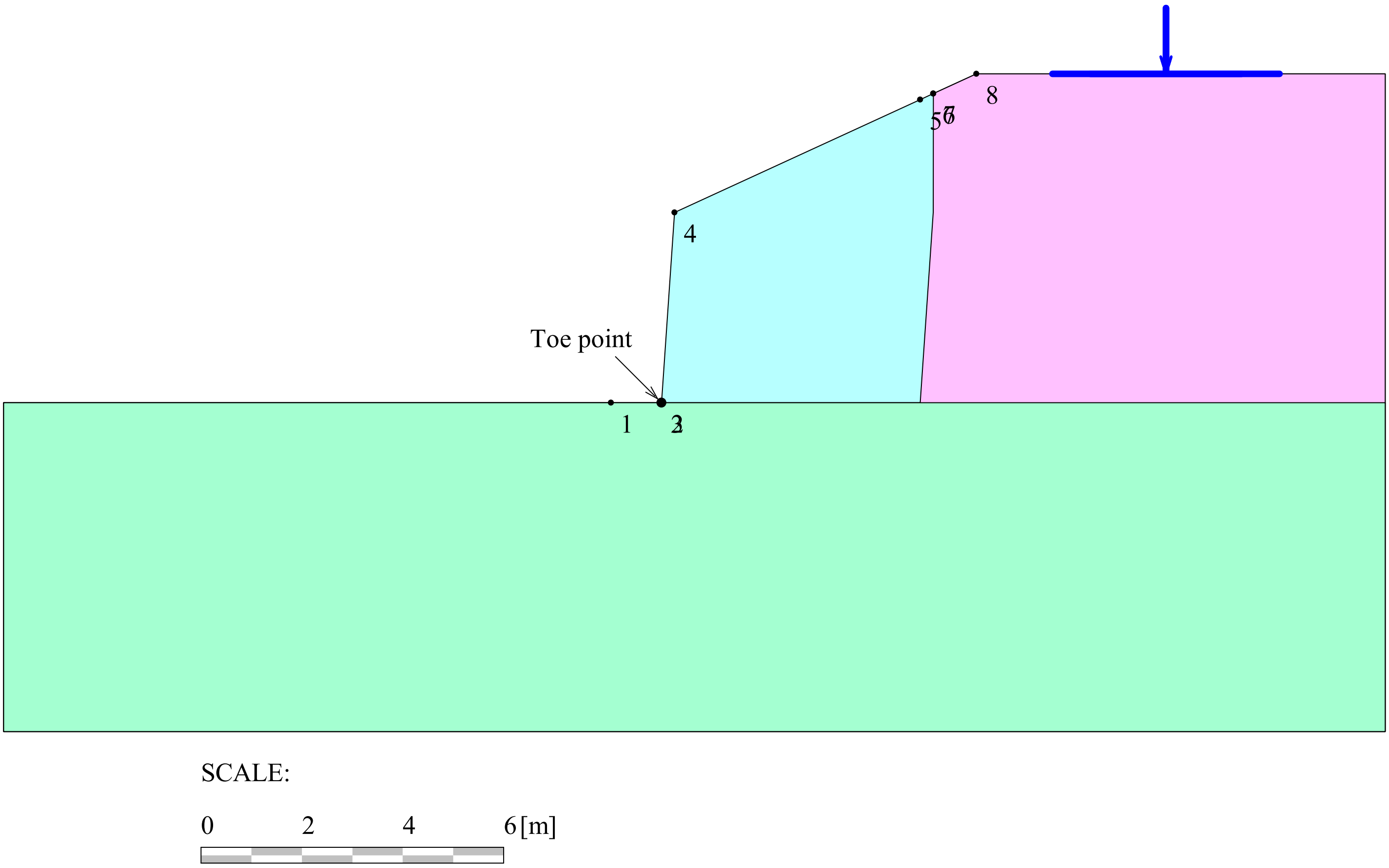
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1....................................None
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

Strip Load #1... 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 10.00 [m]
Strip Load #2... 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 10.00 [m]



Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.26	3.77
	5	6.24	6.52
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	5.13	0.00
	10	5.39	3.77
	11	5.39	6.13
	12	6.24	6.52
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

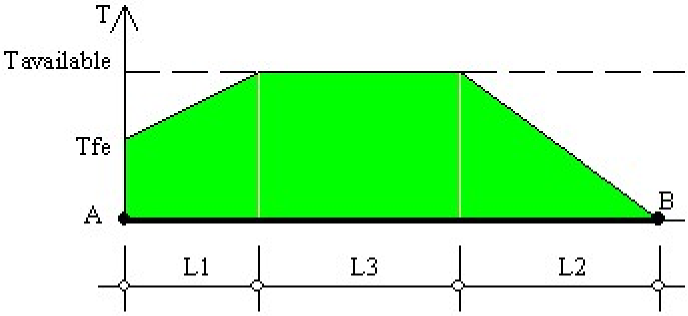
TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.26	3.77	0.00	0.00
5	5.13	6.01	0.00	0.00
6	5.39	6.13	3.77	0.00
7	5.39	6.13	6.13	0.00
8	6.24	6.52	6.52	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---RW-95	0.22	5.13	0.00	0.66	4.47	33.63	33.63
2	---RW-95	0.66	4.33	0.00	0.78	3.55	33.63	33.63
3	---RW-95	1.10	3.72	0.00	0.91	2.81	33.63	33.63
4	---RW-95	1.54	3.10	0.00	1.12	1.98	33.63	33.63
5	---RW-95	1.98	3.00	0.00	1.33	1.67	33.63	33.63
6	---RW-95	2.42	3.00	0.00	1.61	1.39	33.63	33.63
7	---RW-95	2.86	3.00	0.00	2.10	0.90	33.63	33.63
8	---RW-95	3.30	3.00	0.00	3.00	0.00	30.93	30.93 (*)

(*) This Tavailable is dictated by the pullout resistance capacity, which is smaller than the long-term strength of the reinforcement that is related to its specified ultimate strength.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	5.80	6.32	-5.36	0.04	-1.59	6.40	7.39	1.81	
2	6.72	6.52	-4.62	0.00	-0.84	6.55	7.56	1.59	
3	7.64	6.52	-4.08	0.06	-0.33	7.12	7.99	1.46	
4	8.56	6.52	-4.64	0.01	-0.73	8.73	9.55	1.40	
5	9.48	6.52	-3.96	0.00	0.38	8.16	9.25	1.30	
6	10.40	6.52	-4.07	0.05	0.43	9.41	10.38	1.24	
. 7	11.32	6.52	-4.01	0.02	0.32	11.14	11.94	1.21 .	OK
8	12.24	6.52	-5.43	0.05	-0.35	13.55	14.42	1.25	
9	13.16	6.52	-5.36	0.02	-0.31	15.29	16.07	1.31	
10	14.08	6.52	-5.98	0.01	-0.58	17.54	18.34	1.38	
11	15.00	6.52	-6.12	0.05	-0.43	19.20	19.98	1.45	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

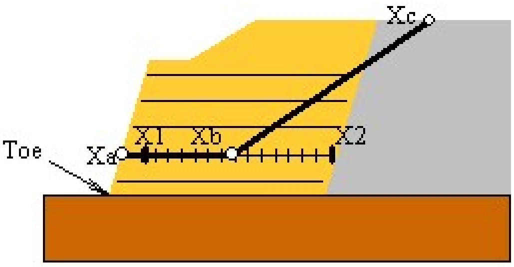
Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-6.73	0.06	11.32	6.52	-0.90	12.22	13.49	1.24	
2	-6.03	0.04	11.32	6.52	-0.60	11.98	13.12	1.23	
3	-5.31	0.01	11.32	6.52	-0.30	11.72	12.74	1.22	
4	-4.76	0.06	11.32	6.52	0.00	11.44	12.34	1.21	
. 5	-4.01	0.02	11.32	6.52	0.32	11.14	11.94	1.21 .	OK
6	-3.42	0.04	11.32	6.52	0.64	10.82	11.52	1.22	
7	-2.80	0.06	11.32	6.52	0.97	10.48	11.08	1.23	
8	-2.00	0.01	11.32	6.52	1.31	10.12	10.64	1.24	
9	-1.33	0.00	11.32	6.52	0.03	12.89	12.96	1.27	
10	-0.70	0.00	11.32	6.52	0.22	12.64	12.67	1.27	
11	-0.00	0.00	11.32	6.52	0.43	12.34	12.35	1.28	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
At toe elevation	0.00	0.00	0.00	2.08	0.00	11.39	6.52	1.25	OK
Reinf. Layer #1	0.22	0.02	0.22	5.09	0.22	11.61	6.52	1.24	Minimum on Edge
Reinf. Layer #2	0.66	0.05	0.66	4.29	0.66	11.53	6.52	1.20	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	3.79	1.10	10.98	6.52	1.19	Minimum on Edge
. Reinf. Layer #4	1.54	0.11	1.54	3.19	1.54	10.04	6.52	1.18	Minimum on Edge
Reinf. Layer #5	1.98	0.14	1.98	3.09	1.98	9.82	6.52	1.21	Minimum on Edge
Reinf. Layer #6	2.42	0.17	2.42	3.19	2.42	9.50	6.52	1.25	Minimum on Edge
Reinf. Layer #7	2.86	0.20	2.86	3.19	2.86	9.05	6.52	1.29	Minimum on Edge
Reinf. Layer #8	3.30	0.23	3.30	3.19	3.30	8.77	6.52	1.34	Minimum on Edge

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.21

Critical Circle: Xc = 0.32[m], Yc = 11.14[m], R = 11.94[m]. (Number of slices used = 57)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

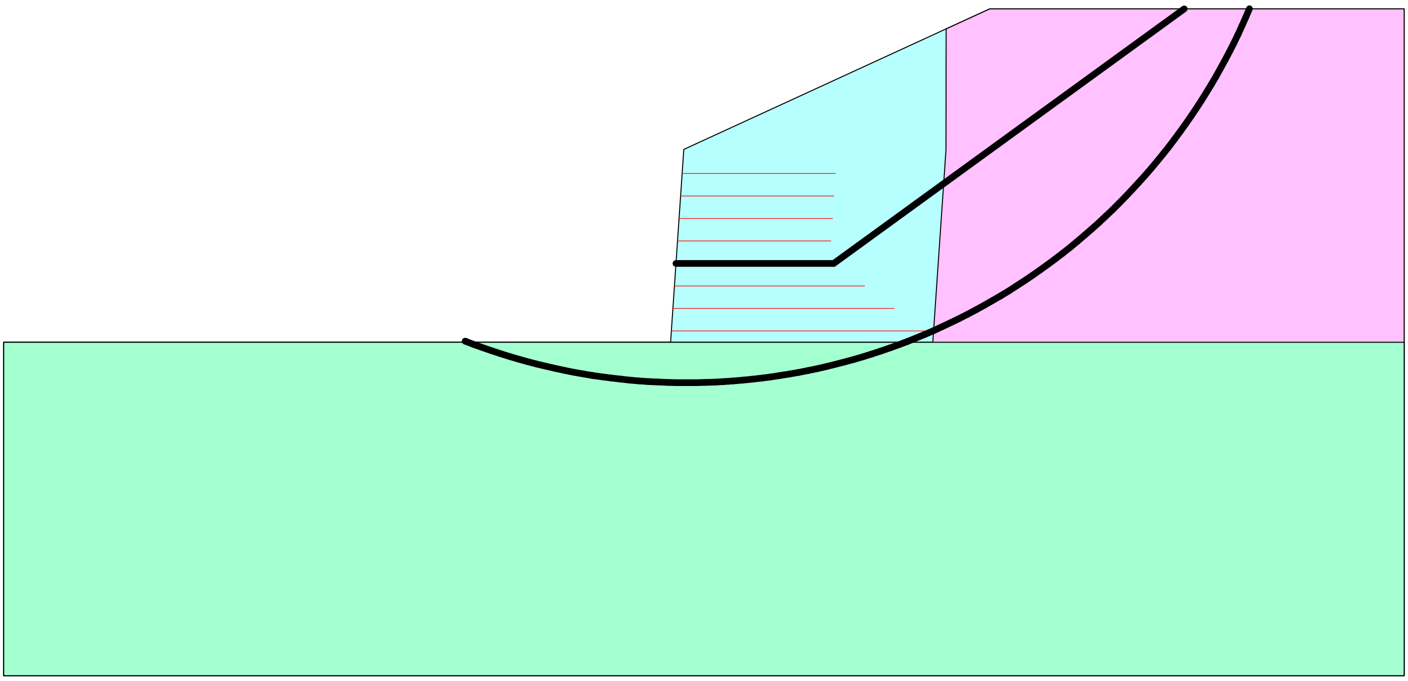
Minimum Factor of Safety = 1.18

Critical Two-Part Wedge: (Xa = 0.11, Ya = 1.54) [m]
(Xb = 3.19, Yb = 1.54) [m]
(Xc = 10.04, Yc = 6.52) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 27.40 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

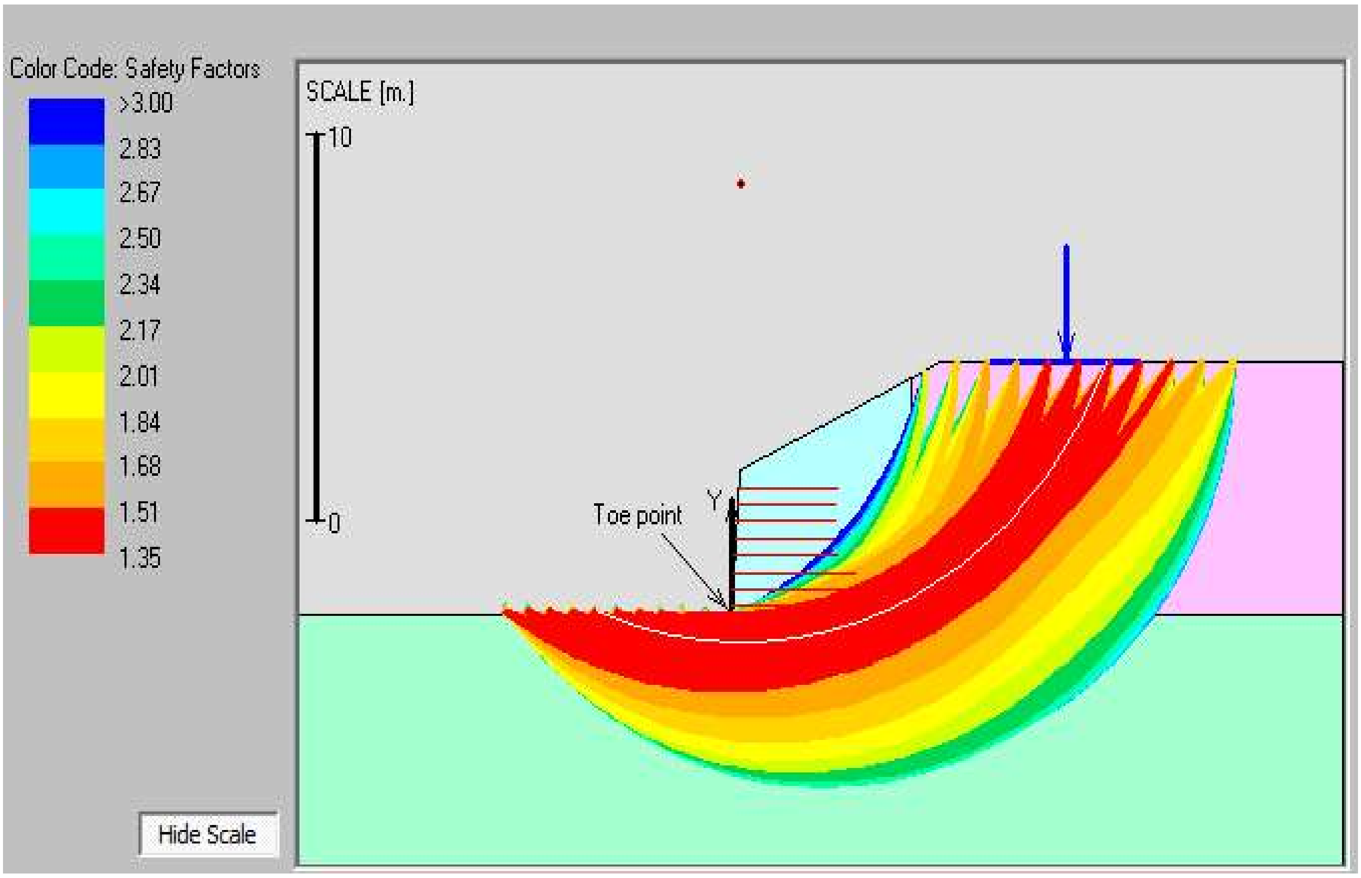
0 2 4 6[m]

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

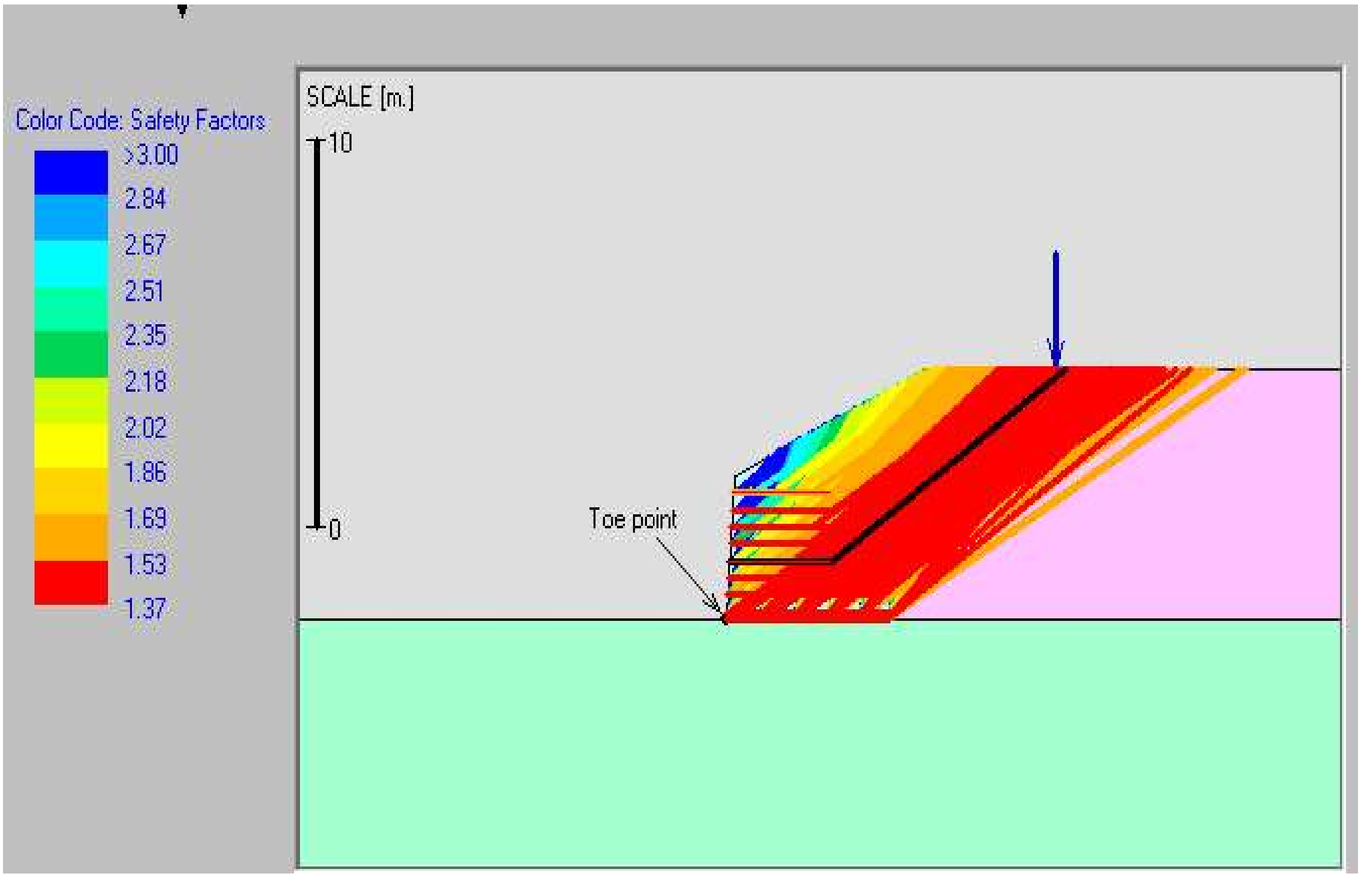
SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc.
www.GeoPrograms.com
License number ReWRG-301204

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



AASHTO 2007 (LRFD)
VK1-km0+825（Combination A）

PROJECT IDENTIFICATION

Title: VK1-km0+825（Combination A）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+825（Combination A）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3366 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3214 Kae (Kh = 0) = 0.3092 Δ Kae = 0.0122 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

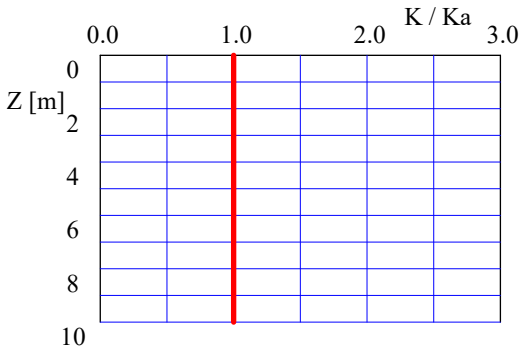
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

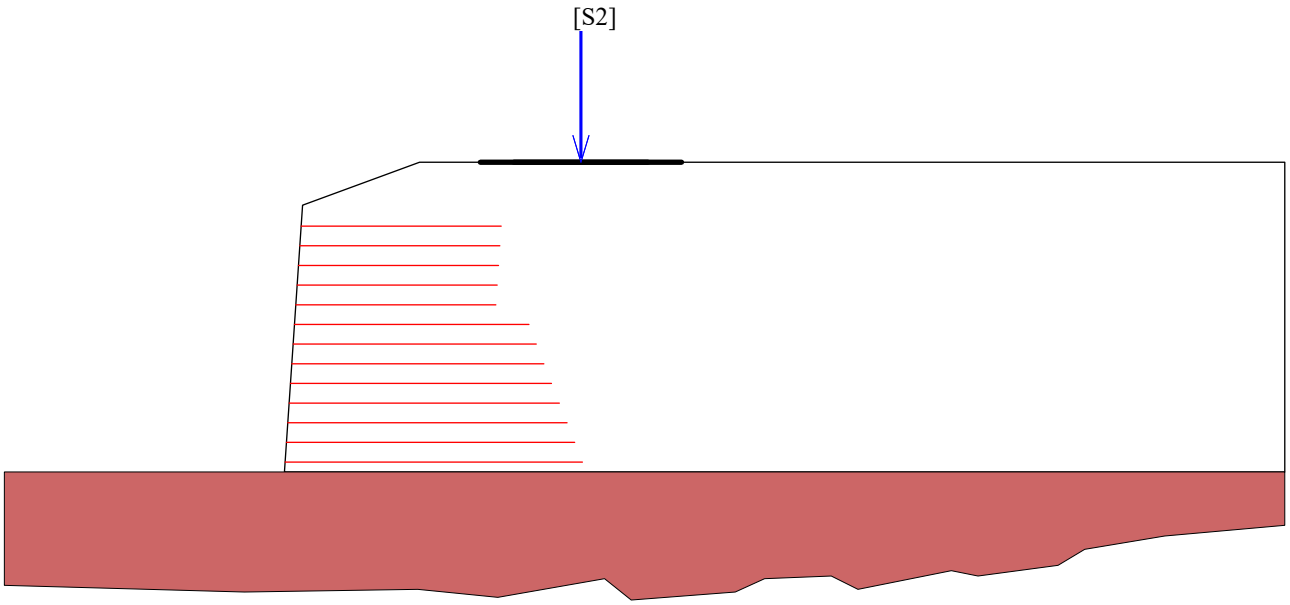
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	5.97	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 5.97 m }
Batter, ω	3.9	[deg]	
Backslope, β	20.1	[deg]	
Backslope rise	1.0	[m]	Broken back equivalent angle, I = 4.60° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 6.2 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 6.2 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.50
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.50
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.50

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic	
Geogrid:		0.90		0.90

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic	
Geogrid:		0.90		0.90

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77		0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static	Combined Static/Seismic	
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.50
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.50

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic	
Reinforced Soil and Foundation	ϕ_τ	0.83		0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77		0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic	
	ϕ_b	0.74		0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 2.93, Meyerhof stress = 238.38 kPa.
Foundation Interface: Direct sliding, CDR = 1.587, Eccentricity, e/L = 0.0835, CDR-overturning = 4.28

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.65	1	N/A	N/A	N/A	1.245	18.504	1.427	0.0780	---RW-95
2	0.66	6.45	1	N/A	N/A	N/A	1.336	17.727	1.411	0.0756	---RW-95
3	1.10	6.25	1	N/A	N/A	N/A	1.443	16.696	1.395	0.0727	---RW-95
4	1.54	6.05	1	N/A	N/A	N/A	1.568	15.661	1.378	0.0691	---RW-95
5	1.98	5.84	1	N/A	N/A	N/A	1.716	14.627	1.361	0.0649	---RW-95
6	2.42	5.64	1	N/A	N/A	N/A	1.895	13.615	1.342	0.0597	---RW-95
7	2.86	5.44	1	N/A	N/A	N/A	2.117	12.601	1.324	0.0534	---RW-95
8	3.30	5.25	1	N/A	N/A	N/A	2.396	11.603	1.304	0.0457	---RW-95
9	3.74	4.48	1	N/A	N/A	N/A	2.761	8.694	1.342	0.0292	---RW-95
10	4.18	4.48	1	N/A	N/A	N/A	3.257	8.323	1.409	0.0100	---RW-95
11	4.62	4.48	1	N/A	N/A	N/A	3.970	8.005	1.483	-0.0110	---RW-95
12	5.06	4.48	1	N/A	N/A	N/A	5.084	7.831	1.569	-0.0359	---RW-95
13	5.50	4.48	1	N/A	N/A	N/A	5.065	5.619	1.674	-0.0700	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

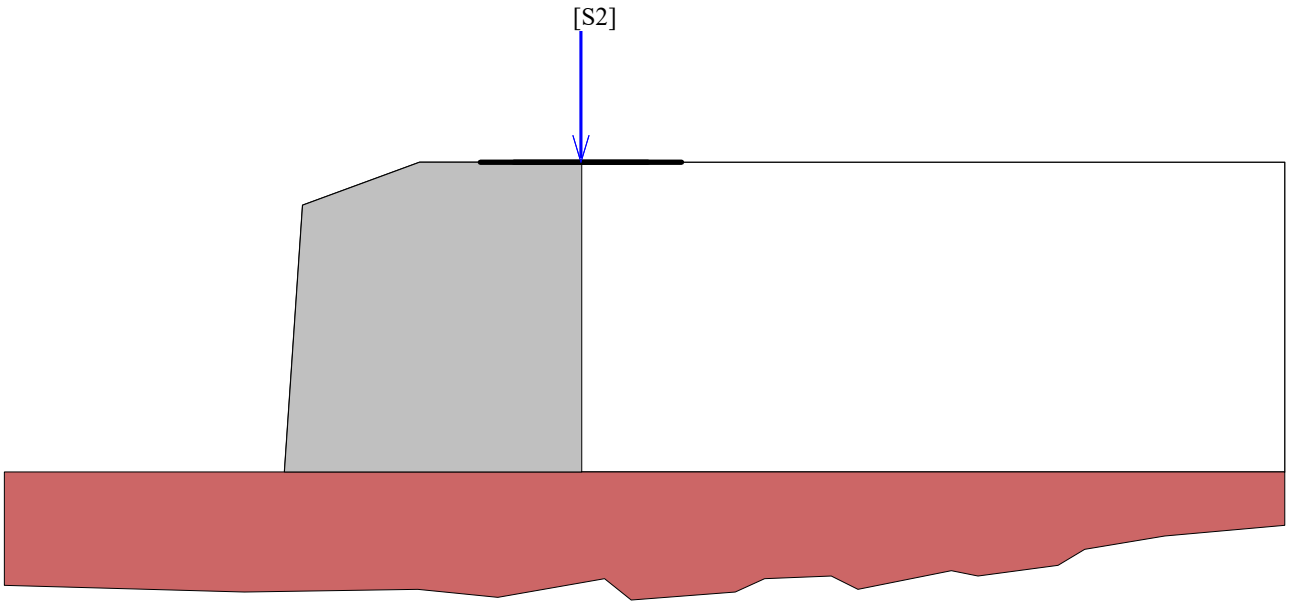
Bearing capacity, CDR = 4.71, Meyerhof stress = 174.77 kPa.
Foundation Interface: Direct sliding, CDR = 1.455, Eccentricity, e/L = 0.1184, Fs-overturning = 3.29

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.65	1	N/A	N/A	N/A	1.205	16.106	1.360	0.1114	---RW-95
2	0.66	6.45	1	N/A	N/A	N/A	1.293	15.423	1.334	0.1091	---RW-95
3	1.10	6.25	1	N/A	N/A	N/A	1.396	14.519	1.307	0.1059	---RW-95
4	1.54	6.05	1	N/A	N/A	N/A	1.516	13.611	1.281	0.1019	---RW-95
5	1.98	5.84	1	N/A	N/A	N/A	1.659	12.704	1.255	0.0970	---RW-95
6	2.42	5.64	1	N/A	N/A	N/A	1.832	11.814	1.228	0.0909	---RW-95
7	2.86	5.44	1	N/A	N/A	N/A	2.044	10.923	1.200	0.0834	---RW-95
8	3.30	5.25	1	N/A	N/A	N/A	2.313	10.043	1.172	0.0742	---RW-95
9	3.74	4.48	1	N/A	N/A	N/A	2.680	7.612	1.216	0.0519	---RW-95
10	4.18	4.48	1	N/A	N/A	N/A	3.153	7.247	1.266	0.0275	---RW-95
11	4.62	4.48	1	N/A	N/A	N/A	3.829	6.914	1.322	0.0012	---RW-95
12	5.06	4.48	1	N/A	N/A	N/A	4.874	6.680	1.386	-0.0291	---RW-95
13	5.50	4.48	1	N/A	N/A	N/A	4.877	4.838	1.468	-0.0689	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	698.4	823.6	[kPa]
Meyerhof stress, σ_V	238.38	174.8	[kPa]
Eccentricity, e	0.27	0.39	[m]
Eccentricity, e/L	0.041	0.058	
CDR calculated	2.93	4.71	
Base length	6.65	6.65	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 1.587 and CDR-seismic = 1.455

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.65	1.427	1.360	1	---RW-95
2	0.66	6.45	1.411	1.334	1	---RW-95
3	1.10	6.25	1.395	1.307	1	---RW-95
4	1.54	6.05	1.378	1.281	1	---RW-95
5	1.98	5.84	1.361	1.255	1	---RW-95
6	2.42	5.64	1.342	1.228	1	---RW-95
7	2.86	5.44	1.324	1.200	1	---RW-95
8	3.30	5.25	1.304	1.172	1	---RW-95
9	3.74	4.48	1.342	1.216	1	---RW-95
10	4.18	4.48	1.409	1.266	1	---RW-95
11	4.62	4.48	1.483	1.322	1	---RW-95
12	5.06	4.48	1.569	1.386	1	---RW-95
13	5.50	4.48	1.674	1.468	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0835, e/L seismic = 0.1184; Overturning: CDR-static = 4.28, CDR-seismic = 3.29

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.65	0.0780	0.1114	1	---RW-95
2	0.66	6.45	0.0756	0.1091	1	---RW-95
3	1.10	6.25	0.0727	0.1059	1	---RW-95
4	1.54	6.05	0.0691	0.1019	1	---RW-95
5	1.98	5.84	0.0649	0.0970	1	---RW-95
6	2.42	5.64	0.0597	0.0909	1	---RW-95
7	2.86	5.44	0.0534	0.0834	1	---RW-95
8	3.30	5.25	0.0457	0.0742	1	---RW-95
9	3.74	4.48	0.0292	0.0519	1	---RW-95
10	4.18	4.48	0.0100	0.0275	1	---RW-95
11	4.62	4.48	-0.0110	0.0012	1	---RW-95
12	5.06	4.48	-0.0359	-0.0291	1	---RW-95
13	5.50	4.48	-0.0700	-0.0689	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

Version 3.0 MSEW Version 3.0 MSEW Version 3.0 MSEW Version 3.0

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	24.32	1.81	N/A	1.245	N/A	1.205	---RW-95
2	0.66	30.3	22.65	1.69	N/A	1.336	N/A	1.293	---RW-95
3	1.10	30.3	20.98	1.58	N/A	1.443	N/A	1.396	---RW-95
4	1.54	30.3	19.31	1.47	N/A	1.568	N/A	1.516	---RW-95
5	1.98	30.3	17.64	1.35	N/A	1.716	N/A	1.659	---RW-95
6	2.42	30.3	15.97	1.24	N/A	1.895	N/A	1.832	---RW-95
7	2.86	30.3	14.30	1.13	N/A	2.117	N/A	2.044	---RW-95
8	3.30	30.3	12.63	1.01	N/A	2.396	N/A	2.313	---RW-95
9	3.74	30.3	10.96	0.74	N/A	2.761	N/A	2.680	---RW-95
10	4.18	30.3	9.29	0.69	N/A	3.257	N/A	3.153	---RW-95
11	4.62	30.3	7.62	0.63	N/A	3.970	N/A	3.829	---RW-95
12	5.06	30.3	5.95	0.57	N/A	5.084	N/A	4.874	---RW-95
13	5.50	30.3	5.98	0.51	N/A	5.065	N/A	4.877	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	24.32	1.81	6.55	0.10	450.0	N/A	18.504	420.7	N/A	16.106
2	0.66	1.000	22.65	1.69	6.14	0.31	401.5	N/A	17.727	375.4	N/A	15.423
3	1.10	1.000	20.98	1.58	5.73	0.52	350.3	N/A	16.696	327.5	N/A	14.519
4	1.54	1.000	19.31	1.47	5.32	0.73	302.4	N/A	15.661	282.8	N/A	13.611
5	1.98	1.000	17.64	1.35	4.90	0.94	258.0	N/A	14.627	241.3	N/A	12.704
6	2.42	1.000	15.97	1.24	4.49	1.15	217.4	N/A	13.615	203.3	N/A	11.814
7	2.86	1.000	14.30	1.13	4.08	1.36	180.2	N/A	12.601	168.5	N/A	10.923
8	3.30	1.000	12.63	1.01	3.68	1.57	146.6	N/A	11.603	137.1	N/A	10.043
9	3.74	1.000	10.96	0.74	2.70	1.78	95.3	N/A	8.694	89.1	N/A	7.612
10	4.18	1.000	9.29	0.69	2.49	1.98	77.3	N/A	8.323	72.3	N/A	7.247
11	4.62	1.000	7.62	0.63	2.28	2.19	61.0	N/A	8.005	57.1	N/A	6.914
12	5.06	1.000	5.95	0.57	2.08	2.40	46.6	N/A	7.831	43.6	N/A	6.680
13	5.50	1.000	5.98	0.51	1.87	2.61	33.6	N/A	5.619	31.4	N/A	4.838

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
VK1-km0+825（Combination B）

PROJECT IDENTIFICATION

Title: VK1-km0+825（Combination B）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+825（Combination B）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: DESIGN
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DESIGN DATA

DESIGN OBJECTIVES

Minimum Capacity Demand Ratio in pullout, CDR-po	1.10
Minimum Capacity Demand Ratio in direct sliding, CDR-sliding	1.10
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.2500
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-static	1.30
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 1.00 m.
Prescribed minimum normalized length of each layer is: L/Hd = 0.75 --> L = 4.48 m.
Prescribed minimum absolute total length of each layer is: L = 3.00 m.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.2500
Min. Capacity Demand Ratio with respect to ultimate bearing capacity (Meyerhof approach)	1.10

Bearing capacity coefficients: Nc = 22.25 N γ= 12.54

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3366 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3214 Kae (Kh = 0) = 0.3092 Δ Kae = 0.0122 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic CDR is 100.0% of specified static CDR for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

BEARING CAPACITY
Seismic CDR is 100.0% of specified static CDR for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic Capacity Demand Ratio in pullout, CDR-po, is 100.0% of its specified static value.
Seismic Capacity Demand Ratio, CDR-overall, is 100.0% of its specified static value.
The reduction of CDR pertains to geogrid strength and to connection strength for break mode of failure.

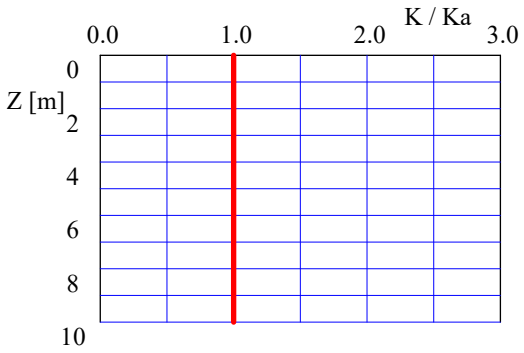
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids
(Multiple type reinforcement)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	1.00	1.00			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

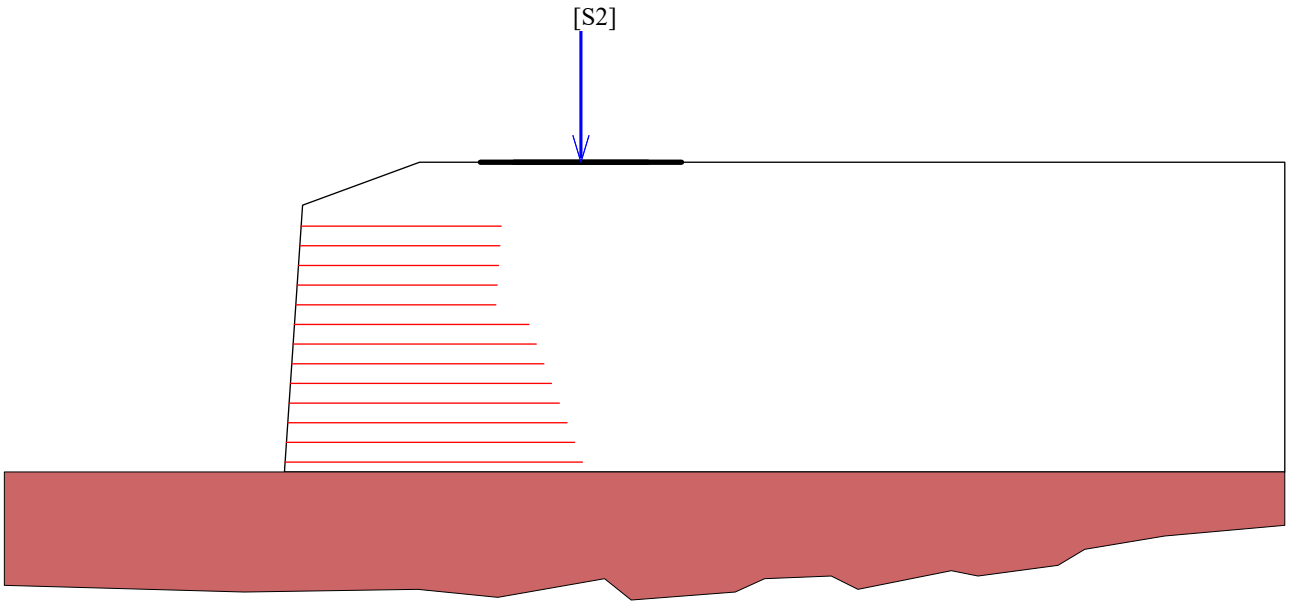
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	5.97	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 5.97 m }
Batter, ω	3.9	[deg]	
Backslope, β	20.1	[deg]	
Backslope rise	1.0	[m]	Broken back equivalent angle, I = 4.60° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 6.2 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 6.2 [m] @ depth of 0.0 [m] below soil surface.

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77	0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.50
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	0.83	0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77	0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:	Static	Combined Static/Seismic
ϕ_b	0.74	0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

REINFORCEMENT LAYOUT AND DESIGN CRITERIA

LEGEND: (1) Connection strength √ Satisfactory
(2) Geogrid strength ⊗ Unsatisfactory
(3) Pullout resistance
(4) Direct sliding
(5) Eccentricity

Bearing capacity: √
Foudation Interface: Direct sliding √ Eccentricity √

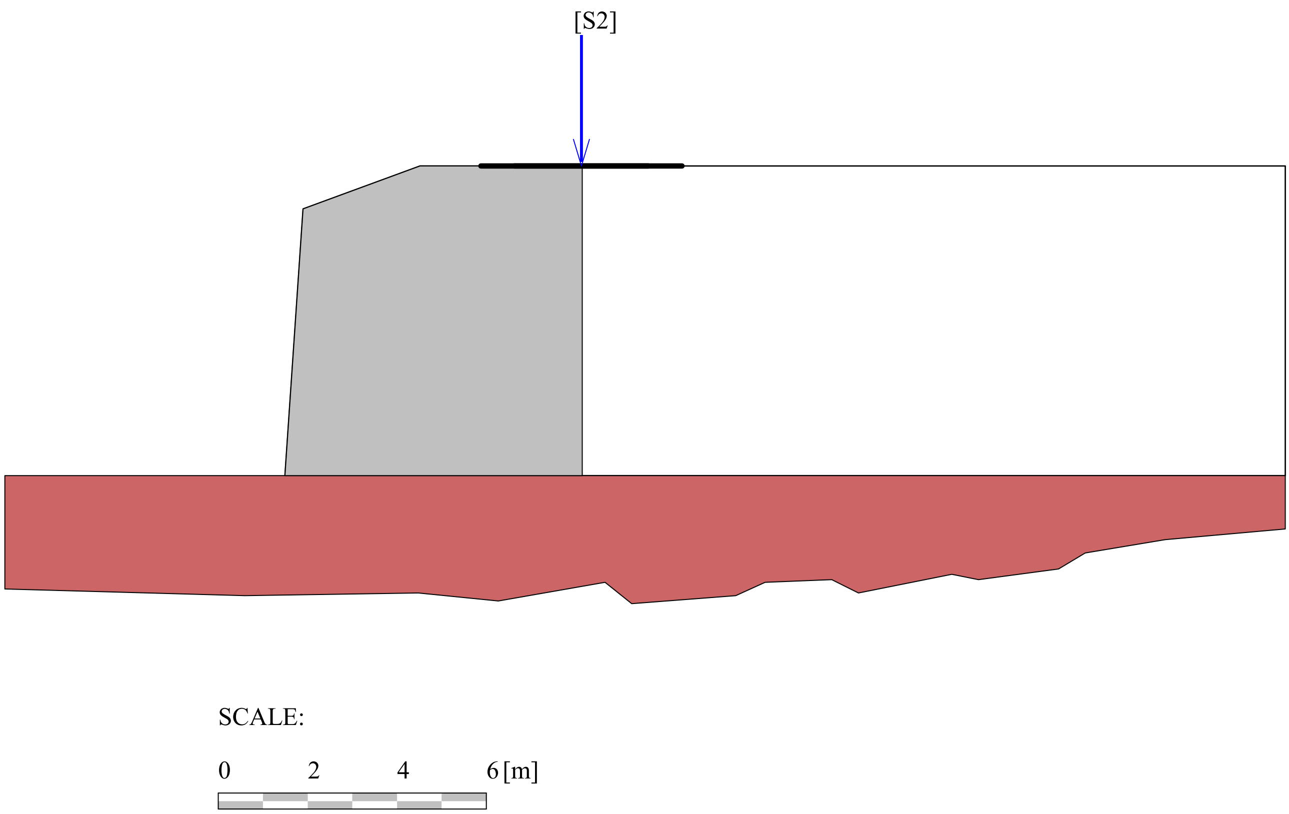
#	Geogrid Elevation [m]	Geogrid Length [m]	Type #	(1)	(2)	(3)	(4)	(5)
1	0.22	6.65	1	N/A	√	√	√	√
2	0.66	6.45	1	N/A	√	√	√	√
3	1.10	6.25	1	N/A	√	√	√	√
4	1.54	6.05	1	N/A	√	√	√	√
5	1.98	5.84	1	N/A	√	√	√	√
6	2.42	5.64	1	N/A	√	√	√	√
7	2.86	5.44	1	N/A	√	√	√	√

#	Geogrid Elevation [m]	Geogrid Length [m]	Type #	(1)	(2)	(3)	(4)	(5)
8	3.30	5.25	1	N/A	√	√	√	√
9	3.74	4.48	1	N/A	√	√	√	√
10	4.18	4.48	1	N/A	√	√	√	√
11	4.62	4.48	1	N/A	√	√	√	√
12	5.06	4.48	1	N/A	√	√	√	√
13	5.50	4.48	1	N/A	√	√	√	√

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for DESIGNED LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	667.8	840.7	[kPa]
Meyerhof stress, σ_V	168.95	161.0	[kPa]
Eccentricity, e	0.44	0.31	[m]
Eccentricity, e/L	0.066	0.047	
CDR calculated	3.95	5.22	
Base length	6.65	6.65	[m]



Copyright ?1998-2007 ADAMA Engineering, Inc.
License number MWRG-301431

DIRECT SLIDING for DESIGNED LAYOUT (for GEOGRID reinforcements)

Specified CDR-static = 1.100 and CDR-seismic = 1.100

Along reinforced and foundation soils interface: CDR-static = 1.261 and CDR-seismic = 1.724

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.65	1.101	1.617	1	---RW-95
2	0.66	6.45	1.101	1.603	1	---RW-95
3	1.10	6.25	1.101	1.589	1	---RW-95
4	1.54	6.05	1.101	1.575	1	---RW-95
5	1.98	5.84	1.101	1.560	1	---RW-95
6	2.42	5.64	1.101	1.545	1	---RW-95
7	2.86	5.44	1.101	1.529	1	---RW-95
8	3.30	5.25	1.101	1.512	1	---RW-95
9	3.74	4.48	1.106	1.545	1	---RW-95
10	4.18	4.48	1.181	1.631	1	---RW-95
11	4.62	4.48	1.268	1.729	1	---RW-95
12	5.06	4.48	1.371	1.843	1	---RW-95
13	5.50	4.48	1.502	1.988	1	---RW-95

ECCENTRICITY for DESIGNED LAYOUT

At interface with foundation: e/L static = 0.1054, e/L seismic = 0.0854; Overturning: CDR-static = 3.54, CDR-seismic = 4.14

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.65	0.0981	0.0794	1	---RW-95
2	0.66	6.45	0.0937	0.0764	1	---RW-95
3	1.10	6.25	0.0887	0.0727	1	---RW-95
4	1.54	6.05	0.0831	0.0684	1	---RW-95
5	1.98	5.84	0.0767	0.0633	1	---RW-95
6	2.42	5.64	0.0695	0.0574	1	---RW-95
7	2.86	5.44	0.0611	0.0504	1	---RW-95
8	3.30	5.25	0.0513	0.0420	1	---RW-95
9	3.74	4.48	0.0390	0.0283	1	---RW-95
10	4.18	4.48	0.0159	0.0078	1	---RW-95
11	4.62	4.48	-0.0088	-0.0145	1	---RW-95
12	5.06	4.48	-0.0371	-0.0409	1	---RW-95
13	5.50	4.48	-0.0746	-0.0768	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	16.2	1.8	1.000	1.867	1.000	1.778	---RW-95
2	0.66	30.3	15.1	1.7	1.000	2.005	1.000	1.909	---RW-95
3	1.10	30.3	14.0	1.6	1.000	2.164	1.000	2.060	---RW-95
4	1.54	30.3	12.9	1.5	1.000	2.351	1.000	2.237	---RW-95
5	1.98	30.3	11.8	1.4	1.000	2.574	1.000	2.448	---RW-95
6	2.42	30.3	10.6	1.2	1.000	2.843	1.000	2.702	---RW-95
7	2.86	30.3	9.5	1.1	1.000	3.175	1.000	3.015	---RW-95
8	3.30	30.3	8.4	1.0	1.000	3.594	1.000	3.410	---RW-95
9	3.74	30.3	7.3	0.7	1.000	4.142	1.000	3.961	---RW-95
10	4.18	30.3	6.2	0.7	1.000	4.886	1.000	4.654	---RW-95
11	4.62	30.3	5.1	0.6	1.000	5.956	1.000	5.642	---RW-95
12	5.06	30.3	4.0	0.6	1.000	7.625	1.000	7.163	---RW-95
13	5.50	30.3	4.0	0.5	1.000	7.598	1.000	7.182	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	16.21	1.81	6.55	0.10	450.0	1.100	27.756	420.7	1.100	23.352
2	0.66	1.000	15.10	1.69	6.14	0.31	401.5	1.100	26.590	375.4	1.100	22.357
3	1.10	1.000	13.99	1.58	5.73	0.52	350.3	1.100	25.045	327.5	1.100	21.042
4	1.54	1.000	12.87	1.47	5.32	0.73	302.4	1.100	23.491	282.8	1.100	19.720
5	1.98	1.000	11.76	1.35	4.90	0.94	258.0	1.100	21.941	241.3	1.100	18.401
6	2.42	1.000	10.65	1.24	4.49	1.15	217.4	1.100	20.422	203.3	1.100	17.106
7	2.86	1.000	9.53	1.13	4.08	1.36	180.2	1.100	18.901	168.5	1.100	15.807
8	3.30	1.000	8.42	1.01	3.68	1.57	146.6	1.100	17.405	137.1	1.100	14.525
9	3.74	1.000	7.31	0.74	2.70	1.78	95.3	1.100	13.041	89.1	1.100	11.066
10	4.18	1.000	6.20	0.69	2.49	1.98	77.3	1.100	12.485	72.3	1.100	10.508
11	4.62	1.000	5.08	0.63	2.28	2.19	61.0	1.100	12.008	57.1	1.100	9.990
12	5.06	1.000	3.97	0.57	2.08	2.40	46.6	1.100	11.746	43.6	1.100	9.600
13	5.50	1.000	3.98	0.51	1.87	2.61	33.6	1.100	8.429	31.4	1.100	6.980

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
VK1-km0+850（Combination C）

PROJECT IDENTIFICATION

Title: VK1-km0+850（Combination C）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+850（Combination C）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL
Unit weight, γ 19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ 33.0 °

RETAINED SOIL
Unit weight, γ 19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ 30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)
Equivalent unit weight, $\gamma_{equiv.}$ 20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$ 26.0 °
Equivalent cohesion, $c_{equiv.}$ 7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, Ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3360 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3209 Kae (Kh = 0) = 0.3088 Δ Kae = 0.0121 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

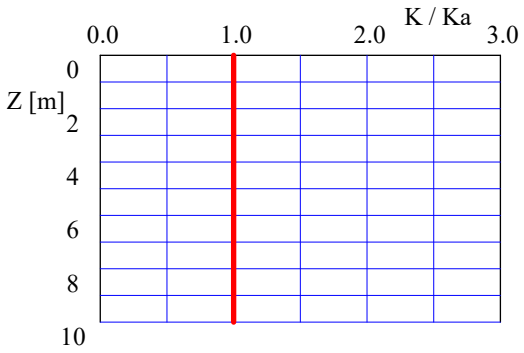
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

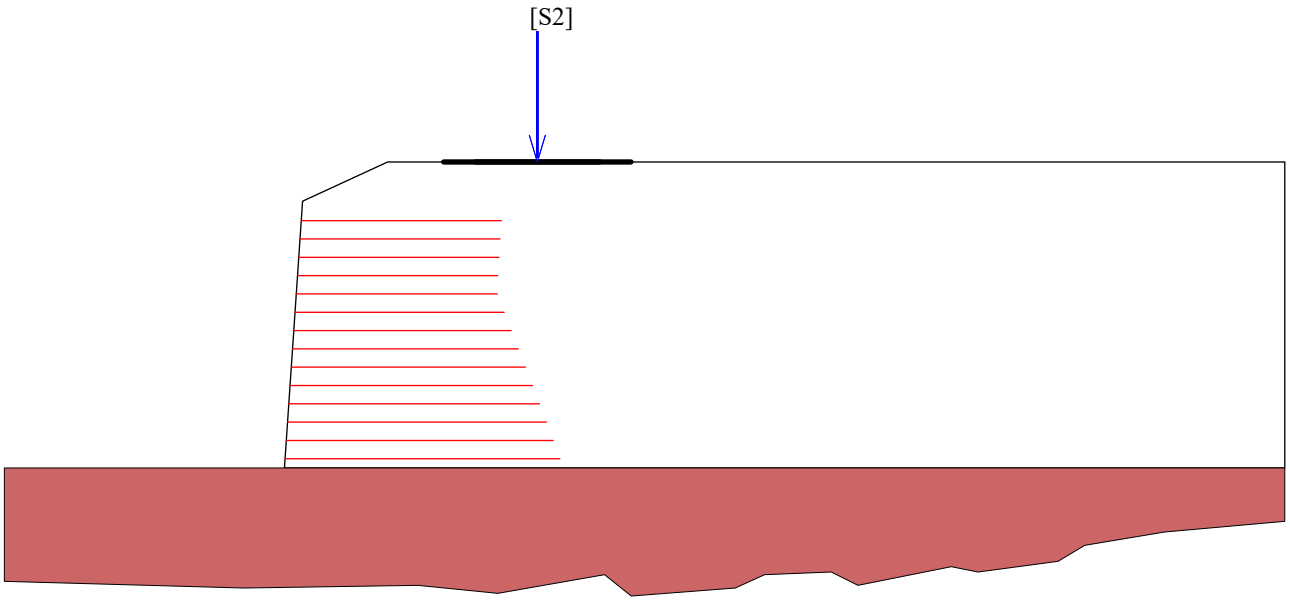
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	6.41	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 6.41 m }
Batter, ω	3.9	[deg]	
Backslope, β	24.7	[deg]	
Backslope rise	0.9	[m]	Broken back equivalent angle, I = 4.19° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00	
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00	
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00	
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00	
Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00
Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00
Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	1.00	1.00

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static	Combined Static/Seismic	
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.00
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	1.00	1.00
Reinforced Soil and Reinforcement	ϕ_τ	1.00	1.00
Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
	ϕ_b	1.00	1.00

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 5.40, Meyerhof stress = 173.65 kPa.
Foundation Interface: Direct sliding, CDR = 2.023, Eccentricity, e/L = 0.0850, CDR-overturning = 4.20

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.60	1	N/A	N/A	N/A	1.730	35.470	1.912	0.0794	---RW-95
2	0.66	6.42	1	N/A	N/A	N/A	1.848	34.059	1.890	0.0776	---RW-95
3	1.10	6.22	1	N/A	N/A	N/A	1.983	32.130	1.867	0.0752	---RW-95
4	1.54	6.03	1	N/A	N/A	N/A	2.139	30.156	1.844	0.0723	---RW-95
5	1.98	5.83	1	N/A	N/A	N/A	2.321	28.158	1.821	0.0687	---RW-95
6	2.42	5.63	1	N/A	N/A	N/A	2.538	26.181	1.797	0.0642	---RW-95
7	2.86	5.43	1	N/A	N/A	N/A	2.799	24.184	1.772	0.0589	---RW-95
8	3.30	5.23	1	N/A	N/A	N/A	3.120	22.171	1.746	0.0523	---RW-95
9	3.74	5.03	1	N/A	N/A	N/A	3.344	19.168	1.719	0.0443	---RW-95
10	4.18	4.83	1	N/A	N/A	N/A	3.591	16.157	1.691	0.0343	---RW-95
11	4.62	4.81	1	N/A	N/A	N/A	4.105	14.981	1.748	0.0147	---RW-95
12	5.06	4.81	1	N/A	N/A	N/A	4.785	13.942	1.819	-0.0079	---RW-95
13	5.50	4.81	1	N/A	N/A	N/A	5.725	12.930	1.893	-0.0344	---RW-95
14	5.94	4.81	1	N/A	N/A	N/A	4.857	8.180	1.968	-0.0692	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, CDR = 5.26, Meyerhof stress = 176.21 kPa.
Foundation Interface: Direct sliding, CDR = 1.931, Eccentricity, e/L = 0.0923, Fs-overturning = 3.98

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.60	1	N/A	N/A	N/A	1.831	25.530	1.826	0.0862	---RW-95
2	0.66	6.42	1	N/A	N/A	N/A	1.955	24.509	1.809	0.0839	---RW-95
3	1.10	6.22	1	N/A	N/A	N/A	2.098	23.116	1.791	0.0810	---RW-95
4	1.54	6.03	1	N/A	N/A	N/A	2.262	21.691	1.774	0.0776	---RW-95
5	1.98	5.83	1	N/A	N/A	N/A	2.455	20.250	1.755	0.0735	---RW-95
6	2.42	5.63	1	N/A	N/A	N/A	2.684	18.825	1.737	0.0685	---RW-95
7	2.86	5.43	1	N/A	N/A	N/A	2.960	17.385	1.718	0.0625	---RW-95
8	3.30	5.23	1	N/A	N/A	N/A	3.299	15.934	1.699	0.0552	---RW-95
9	3.74	5.03	1	N/A	N/A	N/A	3.545	13.843	1.680	0.0465	---RW-95
10	4.18	4.83	1	N/A	N/A	N/A	3.817	11.737	1.660	0.0359	---RW-95
11	4.62	4.81	1	N/A	N/A	N/A	4.354	10.833	1.723	0.0157	---RW-95
12	5.06	4.81	1	N/A	N/A	N/A	5.058	10.012	1.801	-0.0074	---RW-95
13	5.50	4.81	1	N/A	N/A	N/A	6.024	9.198	1.881	-0.0342	---RW-95
14	5.94	4.81	1	N/A	N/A	N/A	5.175	5.972	1.963	-0.0692	---RW-95

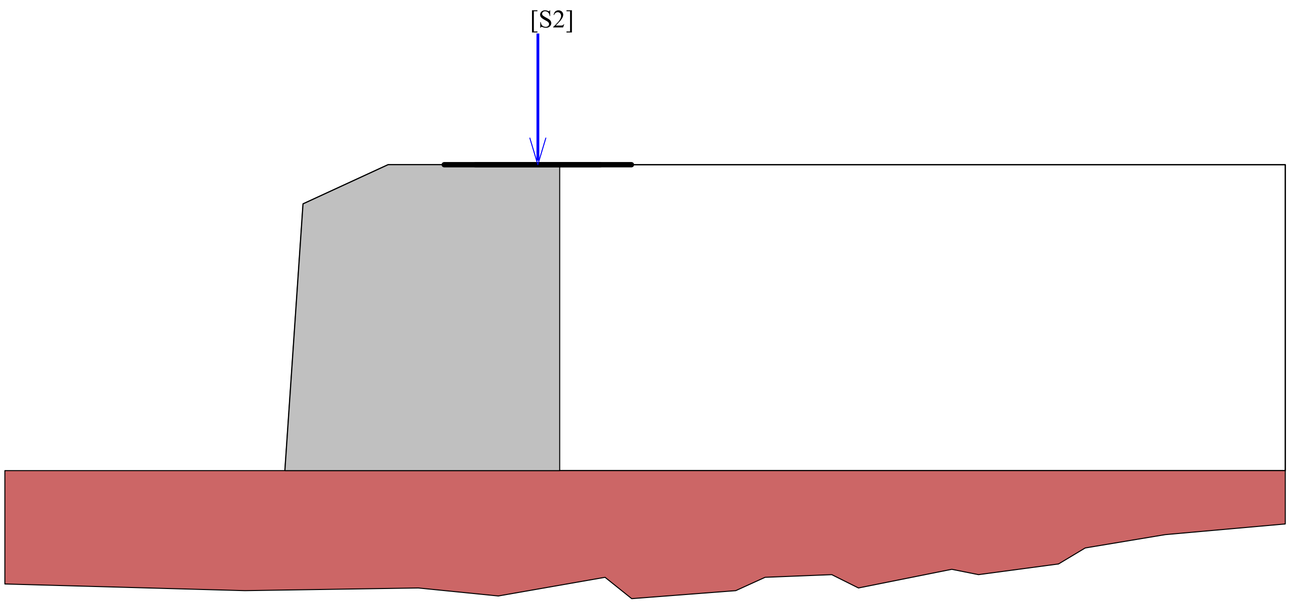
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

Version 3.0 MSEW Version 3.0 MSEW Version 3.0 MSEW Version 3.0

Version 3.0 MSEW Version 3.0 MSEW Version 3.0 MSEW Version 3.0

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	937.4	926.4	[kPa]
Meyerhof stress, σ_V	173.65	176.2	[kPa]
Eccentricity, e	0.28	0.32	[m]
Eccentricity, e/L	0.042	0.048	
CDR calculated	5.40	5.26	
Base length	6.60	6.60	[m]



SCALE:

0 2 4 6 [m]

Version 3.0 MSEW Version 3.0 MSEW Version 3.0 MSEW Version 3.0

Copyright ?1998-2007 ADAMA Engineering, Inc.
License number MWRG-301431
Version 3.0 MSEW Version 3.0 MSEW Version 3.0 MSEW Version 3.0

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 2.023 and CDR-seismic = 1.931

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.60	1.912	1.826	1	---RW-95
2	0.66	6.42	1.890	1.809	1	---RW-95
3	1.10	6.22	1.867	1.791	1	---RW-95
4	1.54	6.03	1.844	1.774	1	---RW-95
5	1.98	5.83	1.821	1.755	1	---RW-95
6	2.42	5.63	1.797	1.737	1	---RW-95
7	2.86	5.43	1.772	1.718	1	---RW-95
8	3.30	5.23	1.746	1.699	1	---RW-95
9	3.74	5.03	1.719	1.680	1	---RW-95
10	4.18	4.83	1.691	1.660	1	---RW-95
11	4.62	4.81	1.748	1.723	1	---RW-95
12	5.06	4.81	1.819	1.801	1	---RW-95
13	5.50	4.81	1.893	1.881	1	---RW-95
14	5.94	4.81	1.968	1.963	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0850, e/L seismic = 0.0923; Overturning: CDR-static = 4.20, CDR-seismic = 3.98

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.60	0.0794	0.0862	1	---RW-95
2	0.66	6.42	0.0776	0.0839	1	---RW-95
3	1.10	6.22	0.0752	0.0810	1	---RW-95
4	1.54	6.03	0.0723	0.0776	1	---RW-95
5	1.98	5.83	0.0687	0.0735	1	---RW-95
6	2.42	5.63	0.0642	0.0685	1	---RW-95
7	2.86	5.43	0.0589	0.0625	1	---RW-95
8	3.30	5.23	0.0523	0.0552	1	---RW-95
9	3.74	5.03	0.0443	0.0465	1	---RW-95
10	4.18	4.83	0.0343	0.0359	1	---RW-95
11	4.62	4.81	0.0147	0.0157	1	---RW-95
12	5.06	4.81	-0.0079	-0.0074	1	---RW-95
13	5.50	4.81	-0.0344	-0.0342	1	---RW-95
14	5.94	4.81	-0.0692	-0.0692	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	17.49	1.95	N/A	1.730	N/A	1.831	---RW-95
2	0.66	30.3	16.38	1.83	N/A	1.848	N/A	1.955	---RW-95
3	1.10	30.3	15.27	1.71	N/A	1.983	N/A	2.098	---RW-95
4	1.54	30.3	14.15	1.59	N/A	2.139	N/A	2.262	---RW-95
5	1.98	30.3	13.04	1.47	N/A	2.321	N/A	2.455	---RW-95
6	2.42	30.3	11.93	1.34	N/A	2.538	N/A	2.684	---RW-95
7	2.86	30.3	10.81	1.22	N/A	2.799	N/A	2.960	---RW-95
8	3.30	30.3	9.70	1.10	N/A	3.120	N/A	3.299	---RW-95
9	3.74	30.3	9.05	0.98	N/A	3.344	N/A	3.545	---RW-95
10	4.18	30.3	8.43	0.85	N/A	3.591	N/A	3.817	---RW-95
11	4.62	30.3	7.37	0.78	N/A	4.105	N/A	4.354	---RW-95
12	5.06	30.3	6.33	0.72	N/A	4.785	N/A	5.058	---RW-95
13	5.50	30.3	5.29	0.66	N/A	5.725	N/A	6.024	---RW-95
14	5.94	30.3	6.23	0.60	N/A	4.857	N/A	5.175	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	17.49	1.95	6.50	0.10	620.5	N/A	35.470	496.4	N/A	25.530
2	0.66	1.000	16.38	1.83	6.10	0.31	557.9	N/A	34.059	446.3	N/A	24.509
3	1.10	1.000	15.27	1.71	5.70	0.52	490.5	N/A	32.130	392.4	N/A	23.116
4	1.54	1.000	14.15	1.59	5.29	0.73	426.8	N/A	30.156	341.4	N/A	21.691
5	1.98	1.000	13.04	1.47	4.89	0.94	367.2	N/A	28.158	293.8	N/A	20.250
6	2.42	1.000	11.93	1.34	4.48	1.15	312.3	N/A	26.181	249.8	N/A	18.825
7	2.86	1.000	10.81	1.22	4.07	1.36	261.5	N/A	24.184	209.2	N/A	17.385
8	3.30	1.000	9.70	1.10	3.66	1.57	215.1	N/A	22.171	172.1	N/A	15.934
9	3.74	1.000	9.05	0.98	3.25	1.78	173.5	N/A	19.168	138.8	N/A	13.843
10	4.18	1.000	8.43	0.85	2.85	1.98	136.2	N/A	16.157	108.9	N/A	11.737
11	4.62	1.000	7.37	0.78	2.61	2.19	110.5	N/A	14.981	88.4	N/A	10.833
12	5.06	1.000	6.33	0.72	2.41	2.40	88.2	N/A	13.942	70.6	N/A	10.012
13	5.50	1.000	5.29	0.66	2.20	2.61	68.4	N/A	12.930	54.7	N/A	9.198
14	5.94	1.000	6.23	0.60	1.99	2.82	51.0	N/A	8.180	40.8	N/A	5.972

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

km0+825 overall stability(no seismicity)

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title: km0+825 overall stability(no seismicity)
Project Number: -
Client:
Designer: 戴征杰（BOSTD）

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\D ..... op\2021\KV1-km0+825 overall stability analysis.MSE
Original date and time of creating this file: Fri Mar 26 13:50:45 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m³]	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
1....... Reinforced Soil.................................	19.5	33.0	0.0
2....... Retained Soil.....................................	19.5	30.0	0.0
3....... Foundation Soil.................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

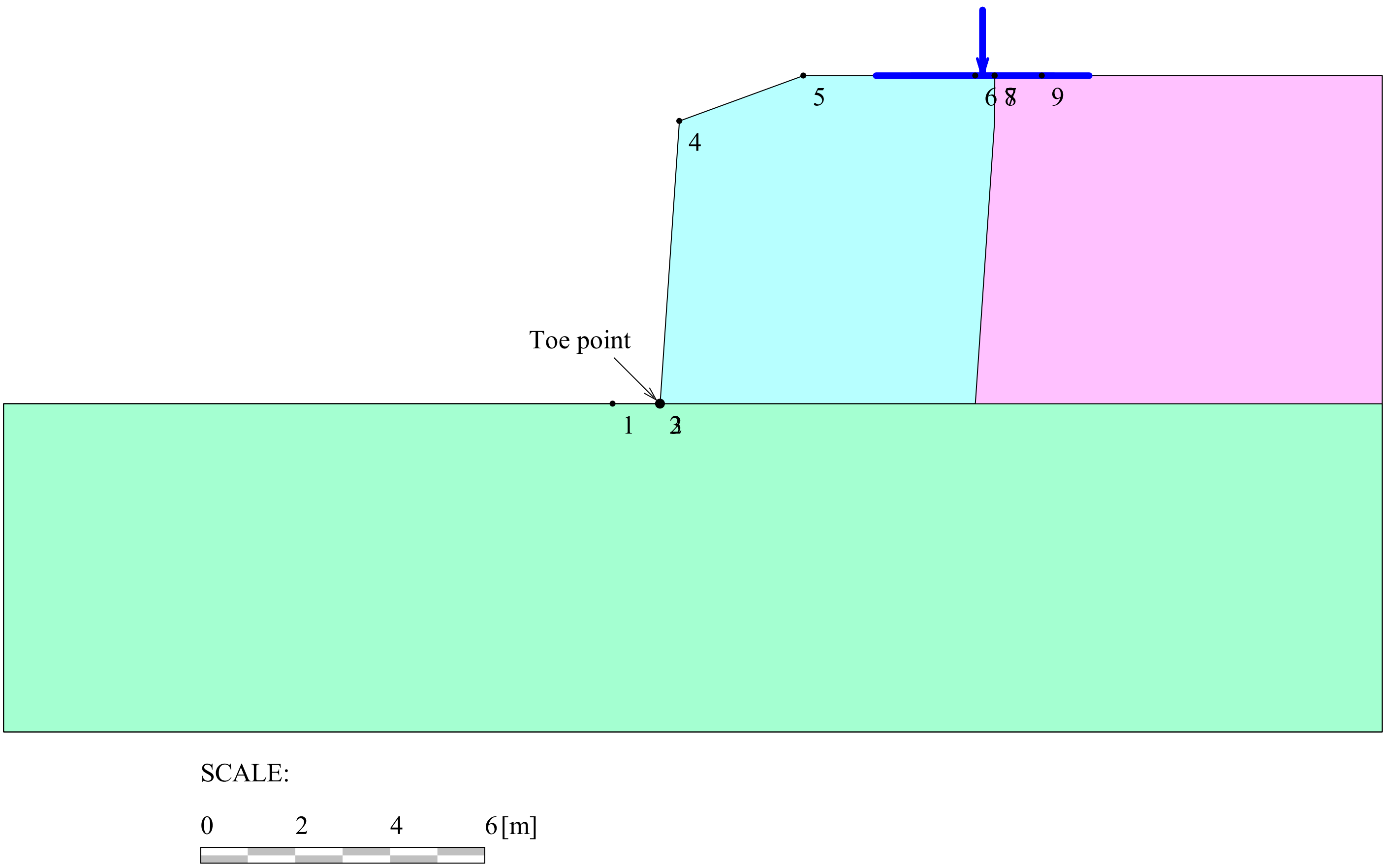
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1....................................None
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

Strip Load #1.. 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 6.81 [m]
Strip Load #2.. 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 6.81 [m]



Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.41	5.97
	5	3.03	6.93
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	6.66	0.00
	10	7.07	5.97
	11	7.07	6.93
	12	8.06	6.93
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

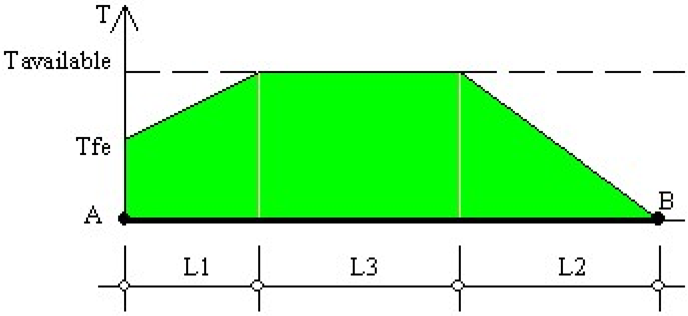
TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.41	5.97	0.00	0.00
5	3.03	6.93	0.00	0.00
6	6.66	6.93	0.00	0.00
7	7.07	6.93	5.97	0.00
8	7.07	6.93	6.93	0.00
9	8.06	6.93	6.93	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---	0.22	6.65	0.00	0.56	6.09	33.63	33.63
2	---	0.66	6.45	0.00	0.60	5.85	33.63	33.63
3	---	1.10	6.25	0.00	0.64	5.61	33.63	33.63
4	---	1.54	6.05	0.00	0.69	5.36	33.63	33.63
5	---	1.98	5.84	0.00	0.76	5.08	33.63	33.63
6	---	2.42	5.64	0.00	0.83	4.81	33.63	33.63
7	---	2.86	5.44	0.00	0.92	4.52	33.63	33.63
8	---	3.30	5.25	0.00	1.03	4.22	33.63	33.63
9	---	3.74	4.48	0.00	1.17	3.31	33.63	33.63
10	---	4.18	4.48	0.00	1.36	3.12	33.63	33.63
11	---	4.62	4.48	0.00	1.61	2.87	33.63	33.63
12	---	5.06	4.48	0.00	2.00	2.48	33.63	33.63
13	---	5.50	4.48	0.00	2.70	1.78	33.63	33.63

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	4.50	6.93	-7.23	0.07	-3.39	6.97	7.89	7.14	
2	5.55	6.93	-7.13	0.02	-2.72	7.01	8.27	2.91	
3	6.60	6.93	-6.47	0.05	-1.81	7.05	8.41	1.98	
4	7.65	6.93	-4.97	0.00	-0.60	7.00	8.25	1.64	
5	8.70	6.93	-5.84	0.11	-0.51	7.66	9.24	1.54	
. 6	9.75	6.93	-6.52	0.09	-0.38	8.27	10.22	1.54 .	OK
7	10.80	6.93	-6.43	0.02	-0.05	9.06	11.06	1.55	
8	11.85	6.93	-5.77	0.05	0.34	10.42	12.03	1.59	
9	12.90	6.93	-6.44	0.03	-0.00	12.53	14.07	1.65	
10	13.95	6.93	-6.57	0.08	-0.09	14.83	16.12	1.72	
11	15.00	6.93	-7.22	0.05	-0.42	17.40	18.64	1.80	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

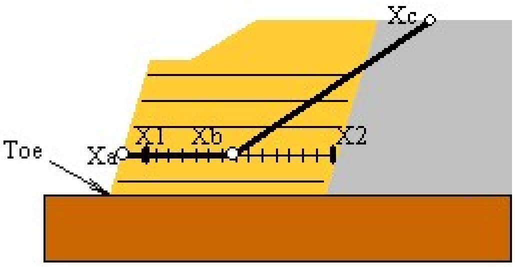
Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-7.10	0.00	9.75	6.93	-0.89	8.86	10.82	1.56	
. 2	-6.52	0.09	9.75	6.93	-0.38	8.27	10.22	1.54 .	OK
3	-5.84	0.11	8.70	6.93	-0.51	7.66	9.24	1.54	
4	-5.13	0.11	9.75	6.93	0.33	7.85	9.47	1.54	
5	-4.39	0.08	8.70	6.93	0.15	7.34	8.56	1.55	
6	-3.56	0.00	8.70	6.93	0.61	6.93	8.09	1.58	
7	-2.86	0.01	8.70	6.93	0.76	7.07	7.94	1.61	
8	-2.26	0.06	8.70	6.93	0.91	7.17	7.79	1.68	
9	-1.50	0.02	8.70	6.93	0.56	7.96	8.20	1.74	
10	-0.80	0.02	8.70	6.93	1.02	7.50	7.70	1.81	
11	-0.00	0.00	8.70	6.93	0.15	8.74	8.74	1.84	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	8.17	6.93	1.40	Minimum on Edge
Reinf. Layer #1	0.22	0.02	0.22	0.10	0.22	8.39	6.93	1.47	Minimum on Edge
Reinf. Layer #2	0.66	0.05	0.66	0.10	0.66	8.42	6.93	1.52	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	0.20	1.10	8.22	6.93	1.58	Minimum on Edge
Reinf. Layer #4	1.54	0.11	1.54	1.40	1.54	8.30	6.93	1.62	OK
Reinf. Layer #5	1.98	0.14	1.98	1.34	1.98	8.41	6.93	1.69	OK
Reinf. Layer #6	2.42	0.17	2.42	4.69	2.42	8.75	6.93	1.68	OK
Reinf. Layer #7	2.86	0.20	2.86	4.53	2.86	8.33	6.93	1.66	OK
Reinf. Layer #8	3.30	0.23	3.30	5.49	3.30	8.33	6.93	1.60	Minimum on Edge
Reinf. Layer #9	3.74	0.26	3.74	4.79	3.74	8.21	6.93	1.52	Minimum on Edge
Reinf. Layer #10	4.18	0.29	4.18	4.79	4.18	7.64	6.93	1.55	Minimum on Edge
Reinf. Layer #11	4.62	0.32	4.62	4.79	4.62	7.27	6.93	1.59	Minimum on Edge
Reinf. Layer #12	5.06	0.35	5.06	4.79	5.06	6.80	6.93	1.63	Minimum on Edge
Reinf. Layer #13	5.50	0.38	5.50	4.89	5.50	6.42	6.93	1.66	Minimum on Edge

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.54

Critical Circle: Xc = -0.38[m], Yc = 8.27[m], R = 10.22[m]. (Number of slices used = 57)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

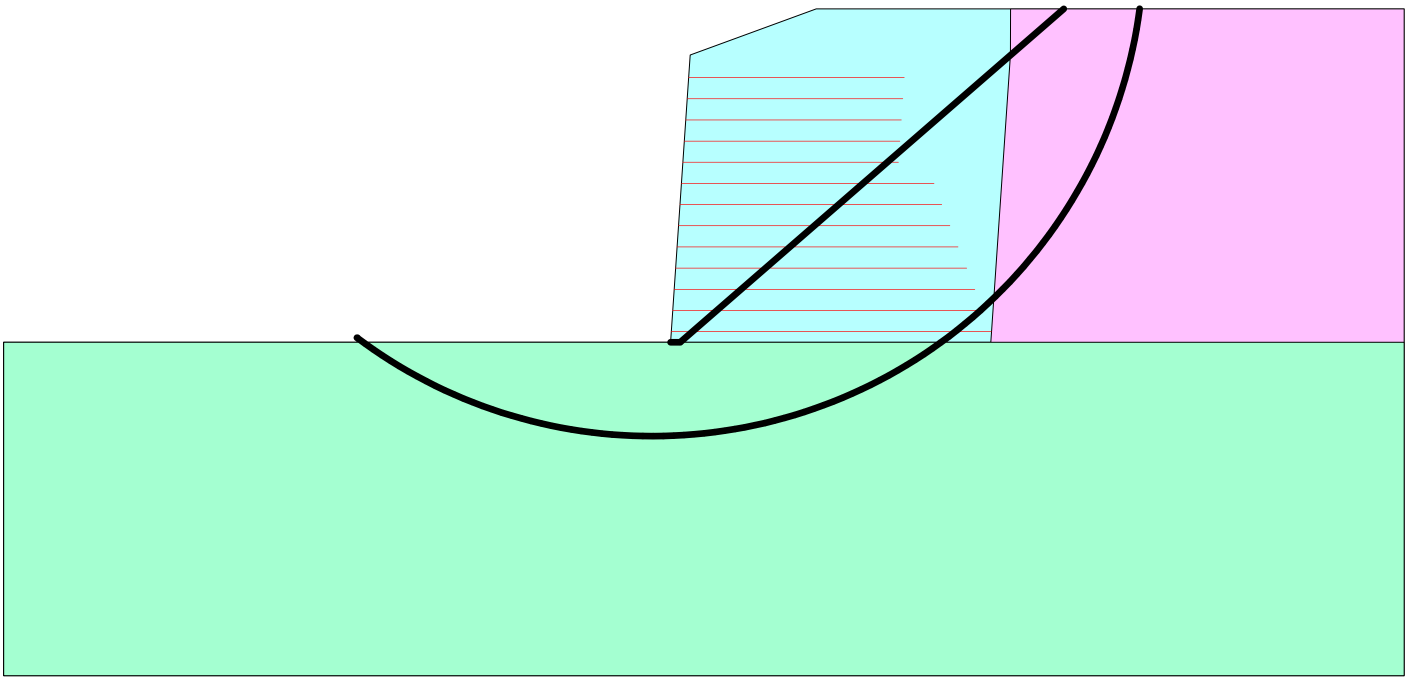
Minimum Factor of Safety = 1.40

Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [m]
(Xb = 0.20, Yb = 0.00) [m]
(Xc = 8.17, Yc = 6.93) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 40.97 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



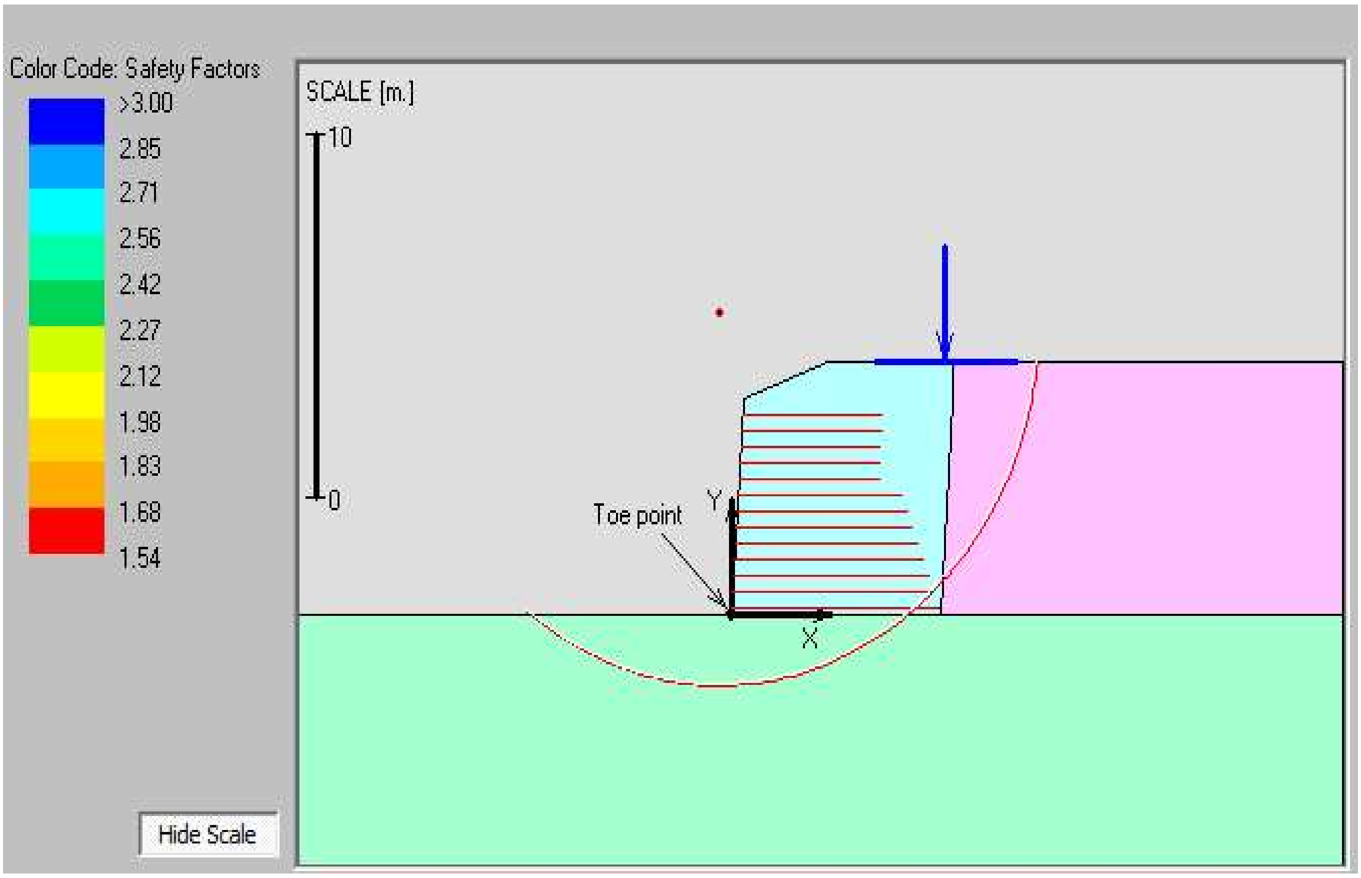
SCALE:

0 2 4 6[m]

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

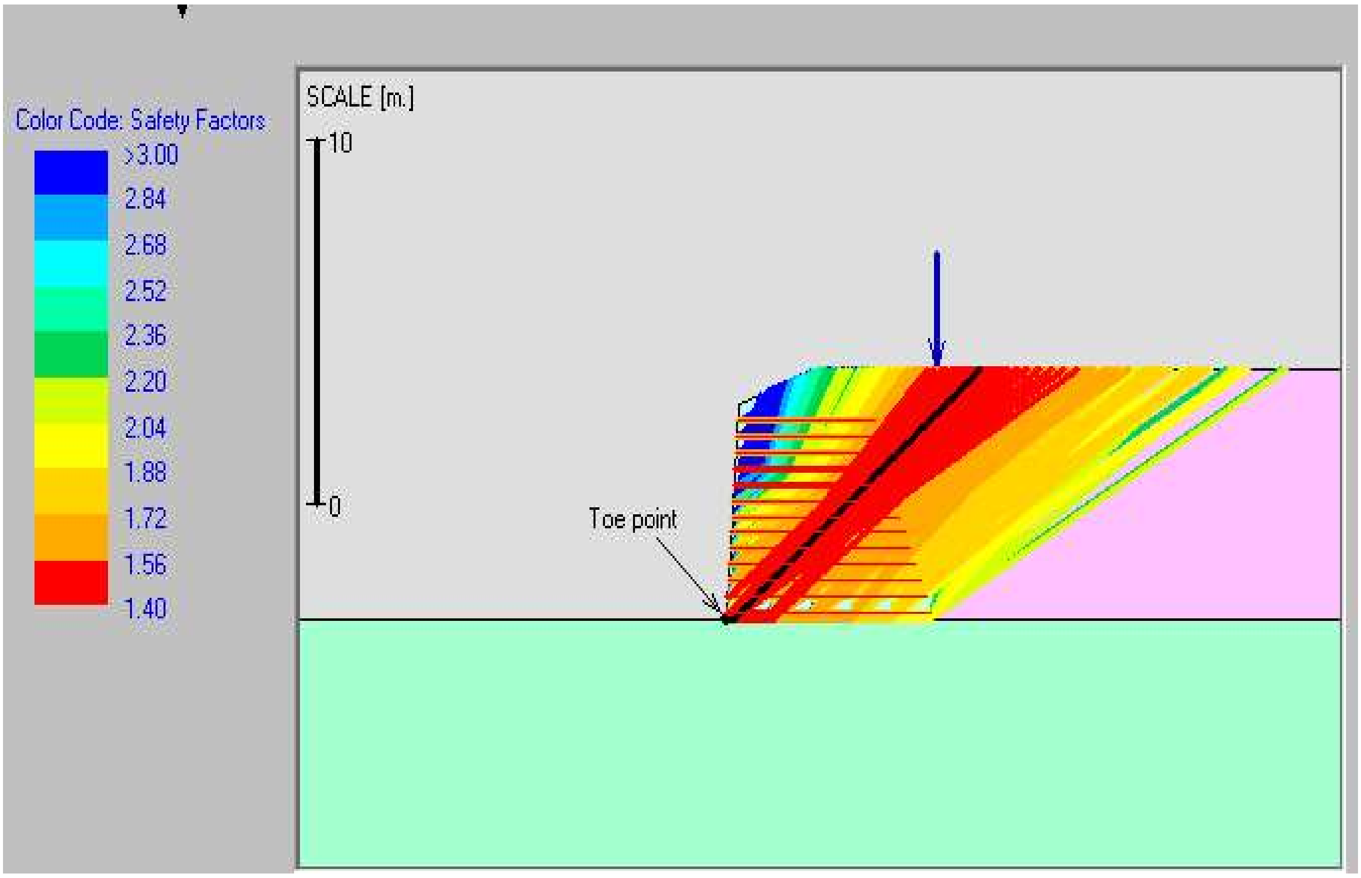
SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



Copyright ?2001-2016 ADAMA Engineering, Inc.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

km0+825 overall stability(seismicity)

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title:	km0+825 overall stability(seismicity)
Project Number:	-
Client:	
Designer:	戴征杰（BOSTD）

Description:

Company's information:

Name:	China Railway Design Corporation Serbia Ogranak Beogrda
Street:	Koste Racina 16b, 11000 Belgrade, Serbia
Telephone #:	
Fax #:	
E-Mail:	

Original file path and name: C:\Users\D ..... op\2021\KV1-km0+825 overall stability analysis.MSE
Original date and time of creating this file: Fri Mar 26 13:50:45 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m 3	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
.1...... Reinforced Soil.................................	19.5	33.0	0.0
.2...... Retained Soil.....................................	19.5	30.0	0.0
.3...... Foundation Soil.................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Horizontal peak ground acceleration coefficient, Ao = 0.140
Design horizontal seismic coefficient, kh = Am = 0.50 x Ao = 0.070 & design vertical seismic coefficient, kv (down) = 0.000 x kh = 0.000

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

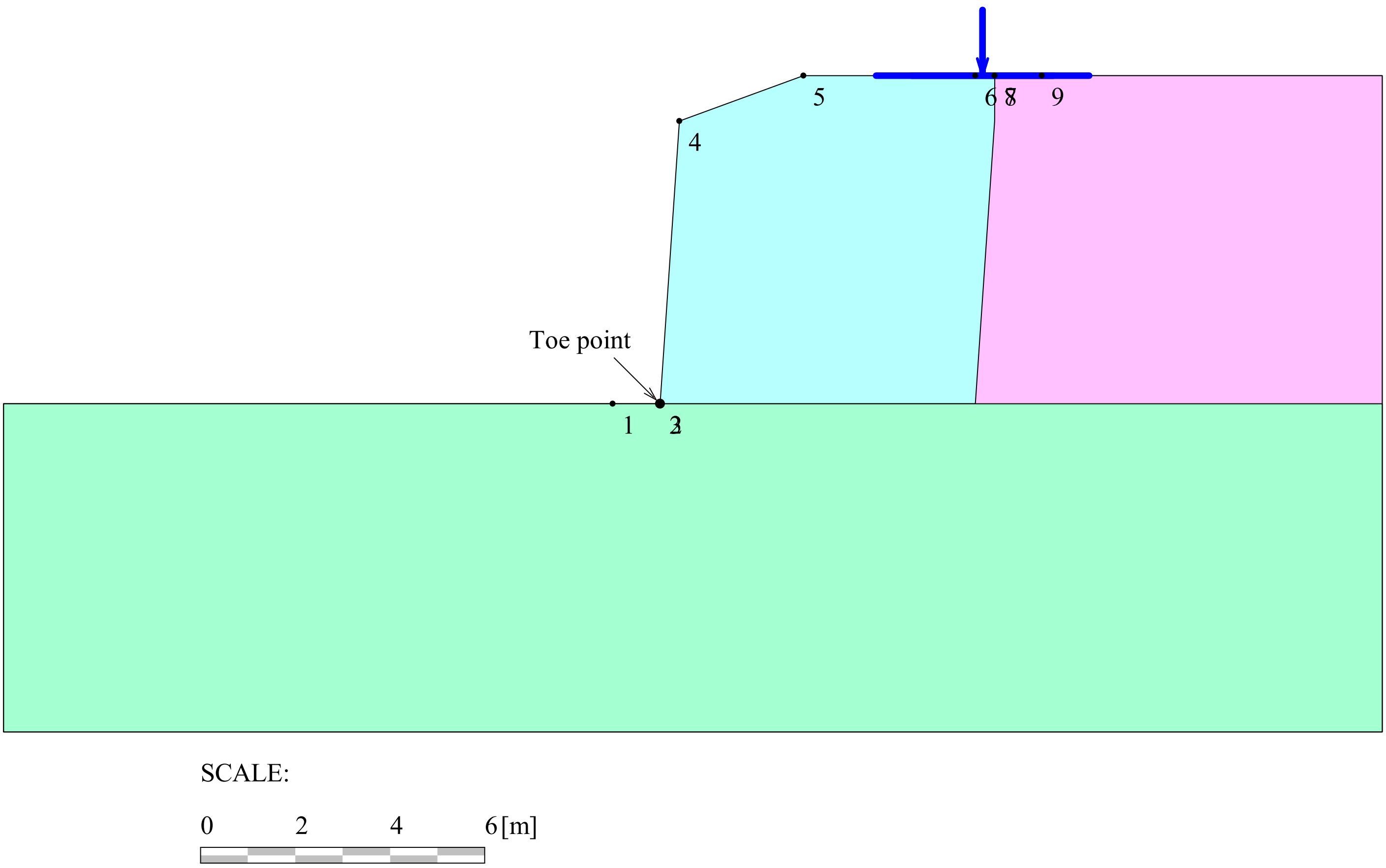
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1 .... None
Surcharge load, Q2 .... None
Surcharge load, Q3 .... None

STRIP LOAD

Strip Load #1 .... 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 6.81 [m]
Strip Load #2 .... 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 6.81 [m]



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.41	5.97
	5	3.03	6.93
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	6.66	0.00
	10	7.07	5.97
	11	7.07	6.93
	12	8.06	6.93
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

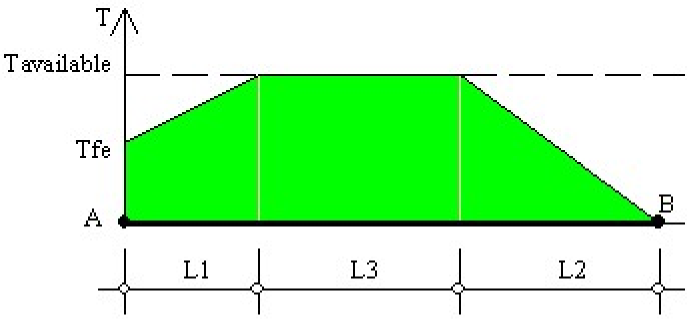
TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.41	5.97	0.00	0.00
5	3.03	6.93	0.00	0.00
6	6.66	6.93	0.00	0.00
7	7.07	6.93	5.97	0.00
8	7.07	6.93	6.93	0.00
9	8.06	6.93	6.93	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---	0.22	6.65	0.00	0.56	6.09	33.63	33.63
2	---	0.66	6.45	0.00	0.60	5.85	33.63	33.63
3	---	1.10	6.25	0.00	0.64	5.61	33.63	33.63
4	---	1.54	6.05	0.00	0.69	5.36	33.63	33.63
5	---	1.98	5.84	0.00	0.76	5.08	33.63	33.63
6	---	2.42	5.64	0.00	0.83	4.81	33.63	33.63
7	---	2.86	5.44	0.00	0.92	4.52	33.63	33.63
8	---	3.30	5.25	0.00	1.03	4.22	33.63	33.63
9	---	3.74	4.48	0.00	1.17	3.31	33.63	33.63
10	---	4.18	4.48	0.00	1.36	3.12	33.63	33.63
11	---	4.62	4.48	0.00	1.61	2.87	33.63	33.63
12	---	5.06	4.48	0.00	2.00	2.48	33.63	33.63
13	---	5.50	4.48	0.00	2.70	1.78	33.63	33.63

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	4.50	6.93	-7.23	0.07	-3.39	6.97	7.89	5.54	
2	5.55	6.93	-7.13	0.02	-2.72	7.01	8.27	2.53	
3	6.60	6.93	-6.47	0.05	-1.81	7.05	8.41	1.78	
4	7.65	6.93	-4.97	0.00	-0.60	7.00	8.25	1.50	
5	8.70	6.93	-5.84	0.11	-0.51	7.66	9.24	1.41	
. 6	9.75	6.93	-6.52	0.09	-0.38	8.27	10.22	1.40 .	OK
7	10.80	6.93	-6.43	0.02	-0.05	9.06	11.06	1.40	
8	11.85	6.93	-7.28	0.11	-0.42	11.11	12.97	1.42	
9	12.90	6.93	-6.44	0.03	-0.00	12.53	14.07	1.45	
10	13.95	6.93	-7.31	0.10	-0.39	15.06	16.49	1.49	
11	15.00	6.93	-7.22	0.05	-0.42	17.40	18.64	1.54	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

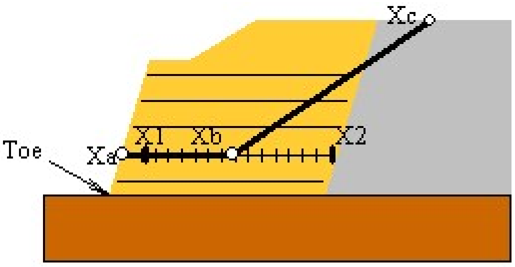
Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-7.18	0.05	10.80	6.93	-0.47	9.46	11.55	1.41	
. 2	-6.52	0.09	9.75	6.93	-0.38	8.27	10.22	1.40 .	OK
3	-5.75	0.05	9.75	6.93	-0.20	8.44	10.06	1.40	
4	-5.13	0.11	9.75	6.93	0.33	7.85	9.47	1.40	
5	-4.33	0.04	9.75	6.93	0.44	8.13	9.39	1.42	
6	-3.66	0.06	9.75	6.93	0.54	8.38	9.33	1.45	
7	-2.86	0.01	8.70	6.93	0.50	7.51	8.22	1.48	
8	-2.27	0.05	8.70	6.93	0.54	7.76	8.20	1.53	
9	-1.50	0.02	8.70	6.93	0.56	7.96	8.20	1.59	
10	-0.79	0.01	9.75	6.93	0.61	9.37	9.46	1.64	
11	-0.00	0.00	8.70	6.93	0.15	8.74	8.74	1.66	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Copyright ?2001-2016 ADAMA Engineering, Inc.

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	8.17	6.93	1.31	Minimum on Edge
Reinf. Layer #1	0.22	0.02	0.22	0.10	0.22	8.39	6.93	1.36	Minimum on Edge
Reinf. Layer #2	0.66	0.05	0.66	0.10	0.66	8.42	6.93	1.41	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	1.44	1.10	8.39	6.93	1.45	OK
Reinf. Layer #4	1.54	0.11	1.54	1.40	1.54	8.30	6.93	1.48	OK
Reinf. Layer #5	1.98	0.14	1.98	4.75	1.98	9.21	6.93	1.49	OK
Reinf. Layer #6	2.42	0.17	2.42	4.69	2.42	8.75	6.93	1.47	OK
Reinf. Layer #7	2.86	0.20	2.86	5.59	2.86	8.77	6.93	1.45	Minimum on Edge
Reinf. Layer #8	3.30	0.23	3.30	5.49	3.30	8.33	6.93	1.41	Minimum on Edge
Reinf. Layer #9	3.74	0.26	3.74	4.79	3.74	8.21	6.93	1.34	Minimum on Edge
Reinf. Layer #10	4.18	0.29	4.18	4.79	4.18	7.64	6.93	1.37	Minimum on Edge
Reinf. Layer #11	4.62	0.32	4.62	4.79	4.62	7.27	6.93	1.40	Minimum on Edge
Reinf. Layer #12	5.06	0.35	5.06	4.79	5.06	6.73	6.93	1.44	Minimum on Edge
Reinf. Layer #13	5.50	0.38	5.50	4.89	5.50	6.37	6.93	1.46	Minimum on Edge

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.40

Critical Circle: Xc = -0.38[m], Yc = 8.27[m], R = 10.22[m]. (Number of slices used = 57)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

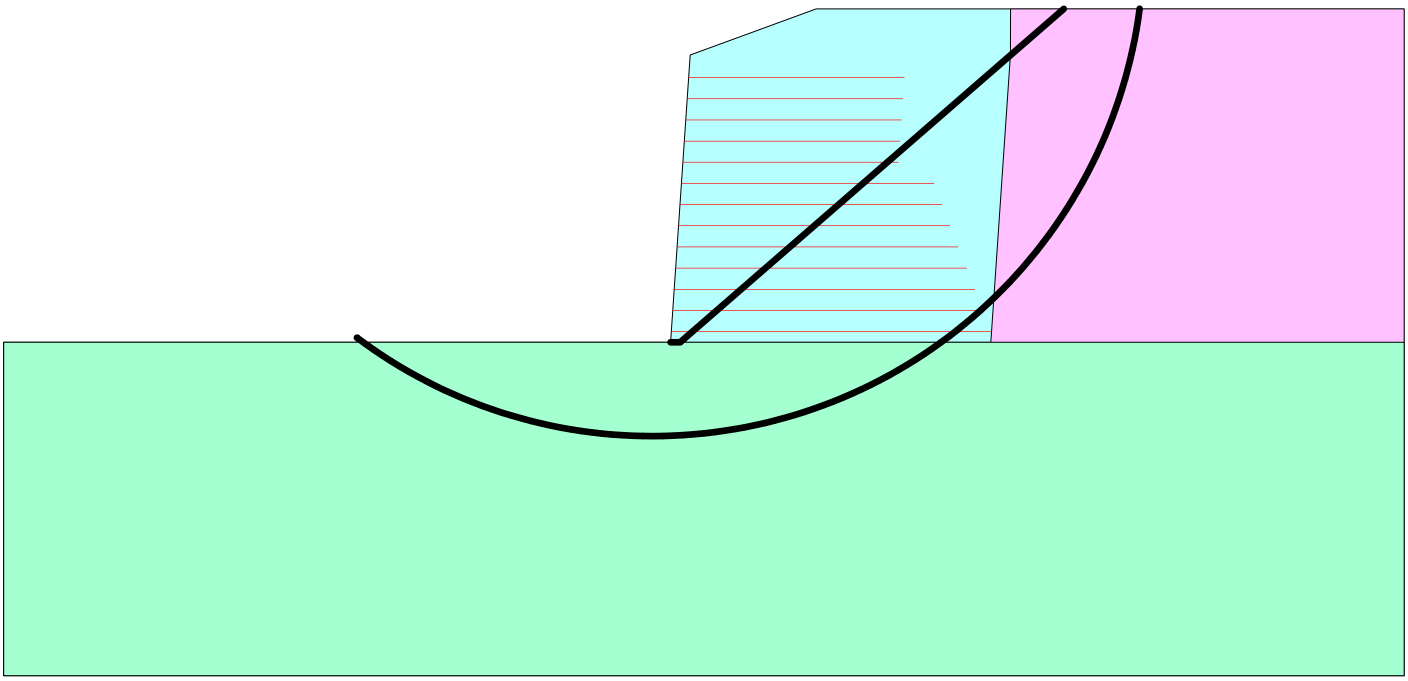
Minimum Factor of Safety = 1.31

Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [m]
(Xb = 0.20, Yb = 0.00) [m]
(Xc = 8.17, Yc = 6.93) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 40.97 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

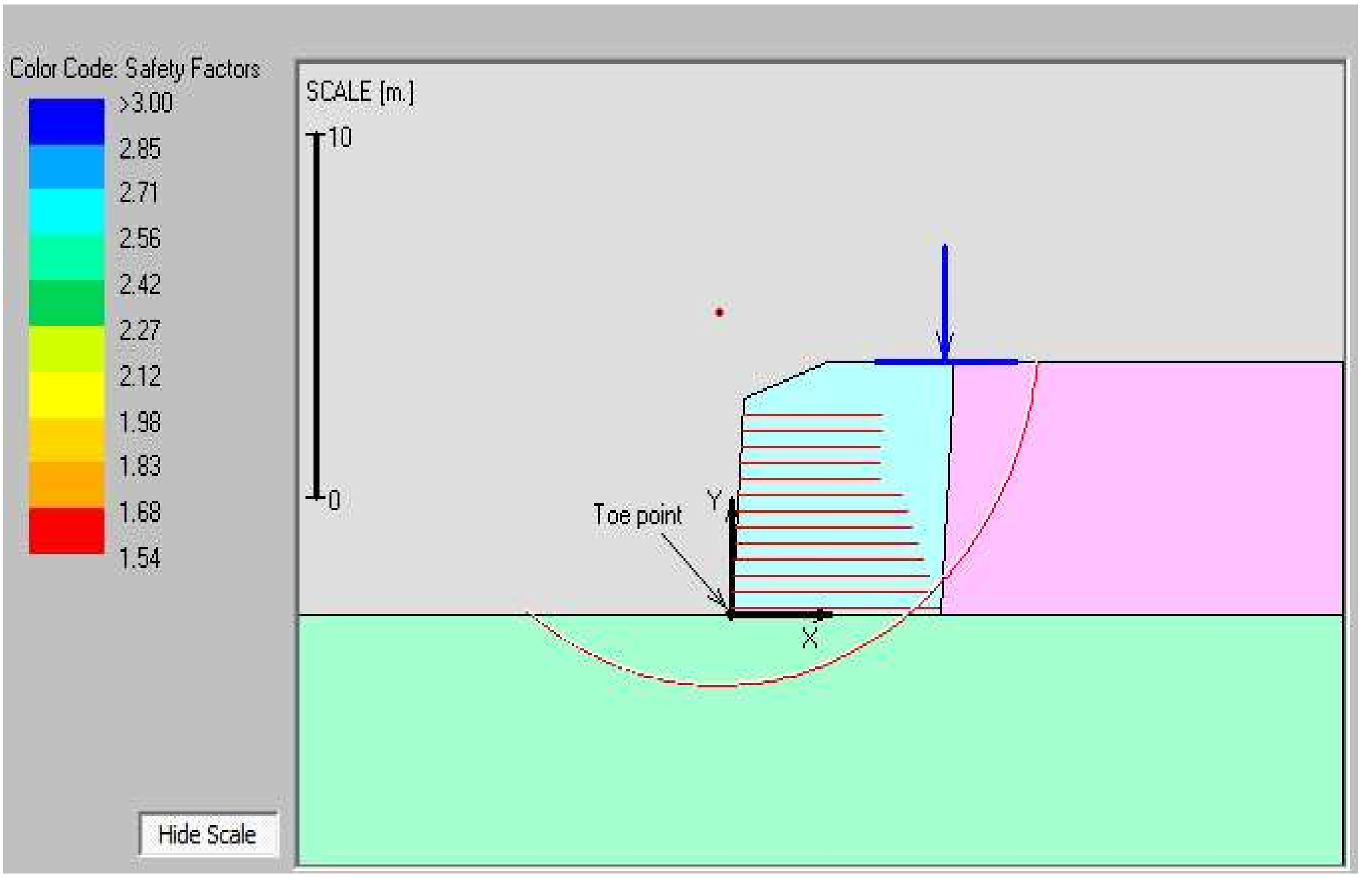
REINFORCEMENT LAYOUT: DRAWING



SCALE:

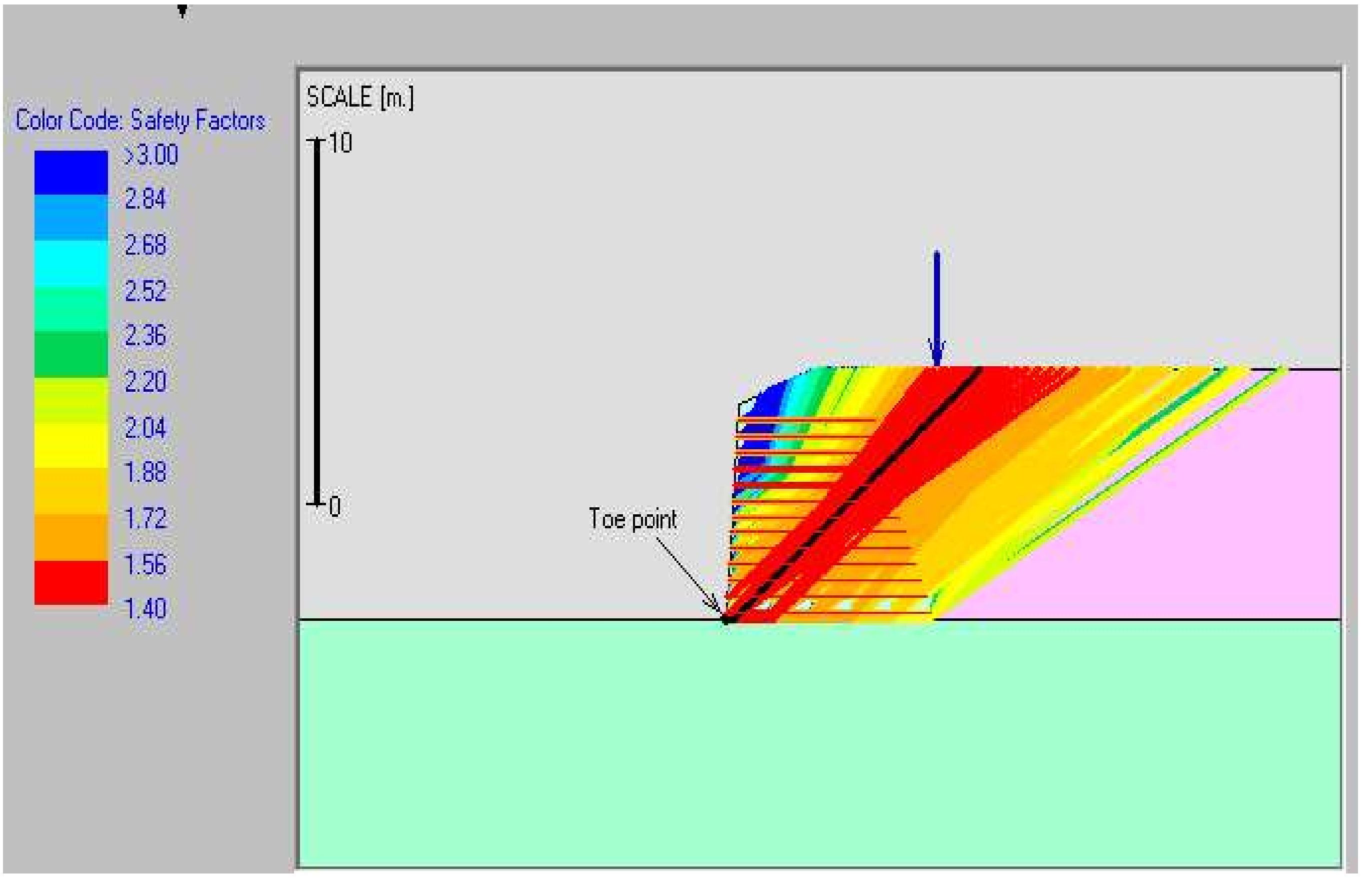
Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

AASHTO 2007 (LRFD)
VK1-km0+850（Combination A）

PROJECT IDENTIFICATION

Title: VK1-km0+850（Combination A）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+850（Combination A）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL
Unit weight, γ 19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ 33.0 °

RETAINED SOIL
Unit weight, γ 19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ 30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)
Equivalent unit weight, $\gamma_{equiv.}$ 20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$ 26.0 °
Equivalent cohesion, $c_{equiv.}$ 7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3360 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3209 Kae (Kh = 0) = 0.3088 Δ Kae = 0.0121 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

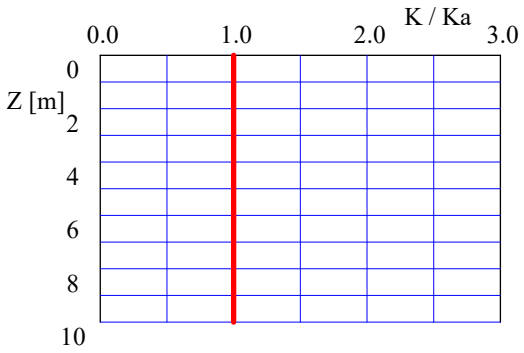
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

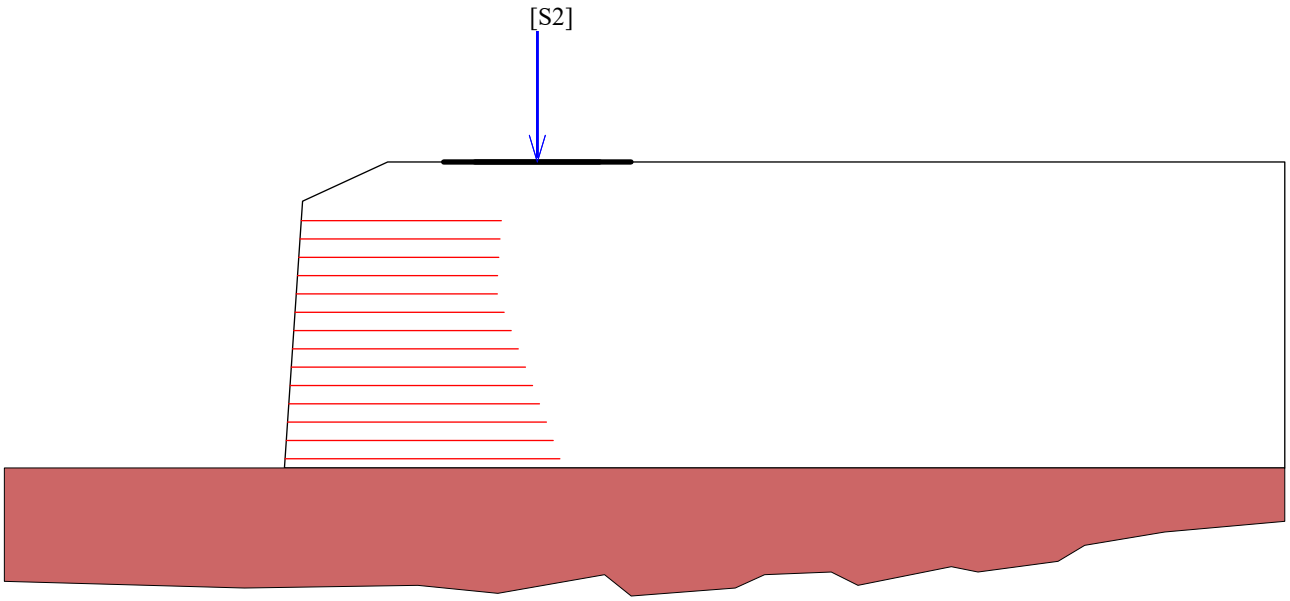
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	6.41	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 6.41 m }
Batter, ω	3.9	[deg]	
Backslope, β	24.7	[deg]	
Backslope rise	0.9	[m]	Broken back equivalent angle, I = 4.19° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.50
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.50
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.50

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77	0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.50
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.50

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	0.83	0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77	0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:	Static	Combined Static/Seismic
ϕ_b	0.74	0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 2.66, Meyerhof stress = 260.48 kPa.
Foundation Interface: Direct sliding, CDR = 1.606, Eccentricity, e/L = 0.0896, CDR-overturning = 4.12

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.60	1	N/A	N/A	N/A	1.154	18.208	1.453	0.0841	---RW-95
2	0.66	6.42	1	N/A	N/A	N/A	1.232	17.484	1.436	0.0825	---RW-95
3	1.10	6.22	1	N/A	N/A	N/A	1.322	16.494	1.418	0.0804	---RW-95
4	1.54	6.03	1	N/A	N/A	N/A	1.426	15.480	1.400	0.0777	---RW-95
5	1.98	5.83	1	N/A	N/A	N/A	1.547	14.454	1.382	0.0744	---RW-95
6	2.42	5.63	1	N/A	N/A	N/A	1.692	13.440	1.363	0.0702	---RW-95
7	2.86	5.43	1	N/A	N/A	N/A	1.866	12.415	1.343	0.0652	---RW-95
8	3.30	5.23	1	N/A	N/A	N/A	2.080	11.381	1.323	0.0589	---RW-95
9	3.74	5.03	1	N/A	N/A	N/A	2.229	9.840	1.301	0.0513	---RW-95
10	4.18	4.83	1	N/A	N/A	N/A	2.394	8.294	1.279	0.0417	---RW-95
11	4.62	4.81	1	N/A	N/A	N/A	2.737	7.690	1.318	0.0230	---RW-95
12	5.06	4.81	1	N/A	N/A	N/A	3.190	7.157	1.365	0.0015	---RW-95
13	5.50	4.81	1	N/A	N/A	N/A	3.816	6.637	1.410	-0.0235	---RW-95
14	5.94	4.81	1	N/A	N/A	N/A	3.238	4.199	1.449	-0.0562	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

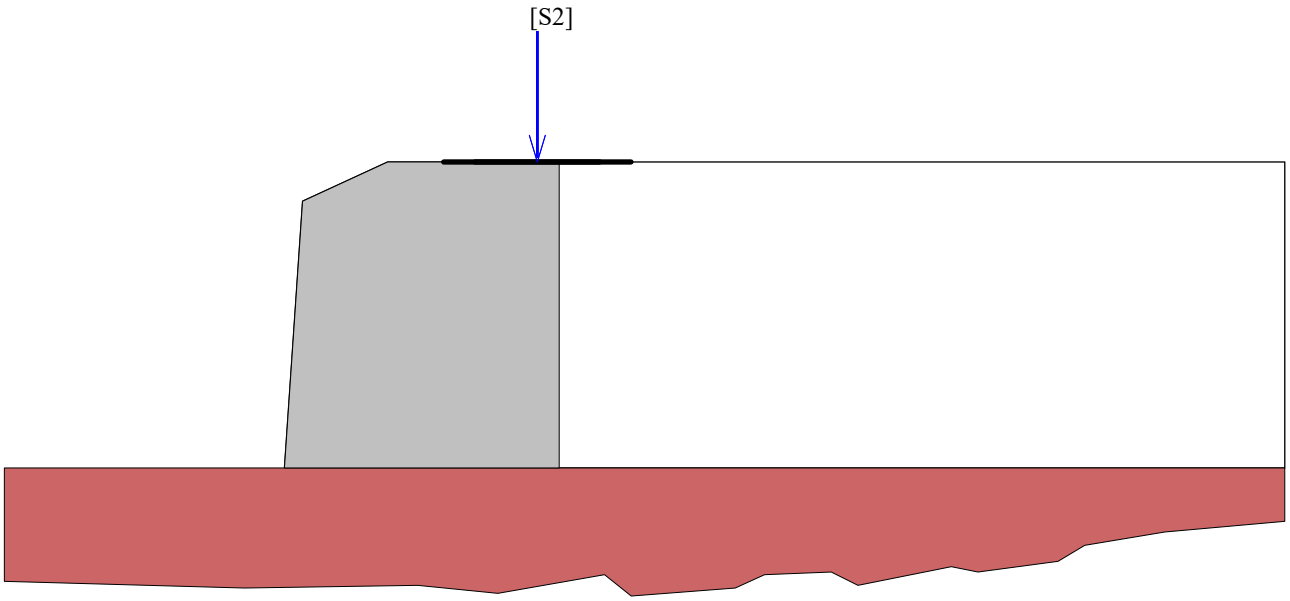
Bearing capacity, CDR = 4.28, Meyerhof stress = 191.84 kPa.
Foundation Interface: Direct sliding, CDR = 1.494, Eccentricity, e/L = 0.1243, Fs-overturning = 3.21

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.60	1	N/A	N/A	N/A	1.116	15.848	1.409	0.1172	---RW-95
2	0.66	6.42	1	N/A	N/A	N/A	1.192	15.215	1.379	0.1161	---RW-95
3	1.10	6.22	1	N/A	N/A	N/A	1.279	14.351	1.349	0.1143	---RW-95
4	1.54	6.03	1	N/A	N/A	N/A	1.379	13.467	1.320	0.1117	---RW-95
5	1.98	5.83	1	N/A	N/A	N/A	1.497	12.573	1.290	0.1082	---RW-95
6	2.42	5.63	1	N/A	N/A	N/A	1.637	11.689	1.261	0.1036	---RW-95
7	2.86	5.43	1	N/A	N/A	N/A	1.805	10.796	1.231	0.0975	---RW-95
8	3.30	5.23	1	N/A	N/A	N/A	2.012	9.896	1.202	0.0899	---RW-95
9	3.74	5.03	1	N/A	N/A	N/A	2.160	8.584	1.173	0.0805	---RW-95
10	4.18	4.83	1	N/A	N/A	N/A	2.324	7.265	1.143	0.0687	---RW-95
11	4.62	4.81	1	N/A	N/A	N/A	2.653	6.715	1.169	0.0441	---RW-95
12	5.06	4.81	1	N/A	N/A	N/A	3.085	6.219	1.204	0.0161	---RW-95
13	5.50	4.81	1	N/A	N/A	N/A	3.679	5.730	1.237	-0.0155	---RW-95
14	5.94	4.81	1	N/A	N/A	N/A	3.148	3.691	1.268	-0.0553	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	693.7	821.6	[kPa]
Meyerhof stress, σ_V	260.48	191.8	[kPa]
Eccentricity, e	0.28	0.37	[m]
Eccentricity, e/L	0.042	0.056	
CDR calculated	2.66	4.28	
Base length	6.60	6.60	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 1.606 and CDR-seismic = 1.494

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.60	1.453	1.409	1	---RW-95
2	0.66	6.42	1.436	1.379	1	---RW-95
3	1.10	6.22	1.418	1.349	1	---RW-95
4	1.54	6.03	1.400	1.320	1	---RW-95
5	1.98	5.83	1.382	1.290	1	---RW-95
6	2.42	5.63	1.363	1.261	1	---RW-95
7	2.86	5.43	1.343	1.231	1	---RW-95
8	3.30	5.23	1.323	1.202	1	---RW-95
9	3.74	5.03	1.301	1.173	1	---RW-95
10	4.18	4.83	1.279	1.143	1	---RW-95
11	4.62	4.81	1.318	1.169	1	---RW-95
12	5.06	4.81	1.365	1.204	1	---RW-95
13	5.50	4.81	1.410	1.237	1	---RW-95
14	5.94	4.81	1.449	1.268	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0896, e/L seismic = 0.1243; Overturning: CDR-static = 4.12, CDR-seismic = 3.21

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.60	0.0841	0.1172	1	---RW-95
2	0.66	6.42	0.0825	0.1161	1	---RW-95
3	1.10	6.22	0.0804	0.1143	1	---RW-95
4	1.54	6.03	0.0777	0.1117	1	---RW-95
5	1.98	5.83	0.0744	0.1082	1	---RW-95
6	2.42	5.63	0.0702	0.1036	1	---RW-95
7	2.86	5.43	0.0652	0.0975	1	---RW-95
8	3.30	5.23	0.0589	0.0899	1	---RW-95
9	3.74	5.03	0.0513	0.0805	1	---RW-95
10	4.18	4.83	0.0417	0.0687	1	---RW-95
11	4.62	4.81	0.0230	0.0441	1	---RW-95
12	5.06	4.81	0.0015	0.0161	1	---RW-95
13	5.50	4.81	-0.0235	-0.0155	1	---RW-95
14	5.94	4.81	-0.0562	-0.0553	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	26.24	1.95	N/A	1.154	N/A	1.116	---RW-95
2	0.66	30.3	24.57	1.83	N/A	1.232	N/A	1.192	---RW-95
3	1.10	30.3	22.90	1.71	N/A	1.322	N/A	1.279	---RW-95
4	1.54	30.3	21.23	1.59	N/A	1.426	N/A	1.379	---RW-95
5	1.98	30.3	19.56	1.47	N/A	1.547	N/A	1.497	---RW-95
6	2.42	30.3	17.89	1.34	N/A	1.692	N/A	1.637	---RW-95
7	2.86	30.3	16.22	1.22	N/A	1.866	N/A	1.805	---RW-95
8	3.30	30.3	14.55	1.10	N/A	2.080	N/A	2.012	---RW-95
9	3.74	30.3	13.58	0.98	N/A	2.229	N/A	2.160	---RW-95
10	4.18	30.3	12.64	0.85	N/A	2.394	N/A	2.324	---RW-95
11	4.62	30.3	11.06	0.78	N/A	2.737	N/A	2.653	---RW-95
12	5.06	30.3	9.49	0.72	N/A	3.190	N/A	3.085	---RW-95
13	5.50	30.3	7.93	0.66	N/A	3.816	N/A	3.679	---RW-95
14	5.94	30.3	9.35	0.60	N/A	3.238	N/A	3.148	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	26.24	1.95	6.50	0.10	477.8	N/A	18.208	446.7	N/A	15.848
2	0.66	1.000	24.57	1.83	6.10	0.31	429.6	N/A	17.484	401.7	N/A	15.215
3	1.10	1.000	22.90	1.71	5.70	0.52	377.7	N/A	16.494	353.2	N/A	14.351
4	1.54	1.000	21.23	1.59	5.29	0.73	328.6	N/A	15.480	307.3	N/A	13.467
5	1.98	1.000	19.56	1.47	4.89	0.94	282.7	N/A	14.454	264.4	N/A	12.573
6	2.42	1.000	17.89	1.34	4.48	1.15	240.5	N/A	13.440	224.8	N/A	11.689
7	2.86	1.000	16.22	1.22	4.07	1.36	201.4	N/A	12.415	188.3	N/A	10.796
8	3.30	1.000	14.55	1.10	3.66	1.57	165.6	N/A	11.381	154.9	N/A	9.896
9	3.74	1.000	13.58	0.98	3.25	1.78	133.6	N/A	9.840	124.9	N/A	8.584
10	4.18	1.000	12.64	0.85	2.85	1.98	104.9	N/A	8.294	98.0	N/A	7.265
11	4.62	1.000	11.06	0.78	2.61	2.19	85.1	N/A	7.690	79.5	N/A	6.715
12	5.06	1.000	9.49	0.72	2.41	2.40	67.9	N/A	7.157	63.5	N/A	6.219
13	5.50	1.000	7.93	0.66	2.20	2.61	52.6	N/A	6.637	49.2	N/A	5.730
14	5.94	1.000	9.35	0.60	1.99	2.82	39.2	N/A	4.199	36.7	N/A	3.691

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
VK1-km0+850（Combination B）

PROJECT IDENTIFICATION

Title: VK1-km0+850（Combination B）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+850（Combination B）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: DESIGN
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DESIGN DATA

DESIGN OBJECTIVES

Minimum Capacity Demand Ratio in pullout, CDR-po	1.10
Minimum Capacity Demand Ratio in direct sliding, CDR-sliding	1.10
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.2500
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-static	1.30
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 1.00 m.
Prescribed minimum normalized length of each layer is: L/Hd = 0.75 --> L = 4.81 m.
Prescribed minimum absolute total length of each layer is: L = 3.00 m.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L	0.2500
Min. Capacity Demand Ratio with respect to ultimate bearing capacity (Meyerhof approach)	1.10

Bearing capacity coefficients: Nc = 22.25 N γ= 12.54

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m^3
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m^3
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m^3
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3360 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3209 Kae (Kh = 0) = 0.3088 Δ Kae = 0.0121 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic CDR is 100.0% of specified static CDR for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

BEARING CAPACITY

Seismic CDR is 100.0% of specified static CDR for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic Capacity Demand Ratio in pullout, CDR-po, is 100.0% of its specified static value.
Seismic Capacity Demand Ratio, CDR-overall, is 100.0% of its specified static value.
The reduction of CDR pertains to geogrid strength and to connection strength for break mode of failure.

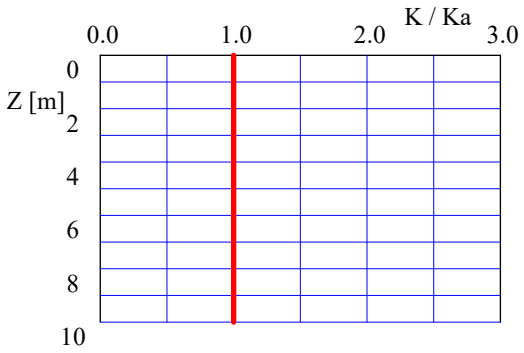
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids
(Multiple type reinforcement)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	1.00	1.00			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

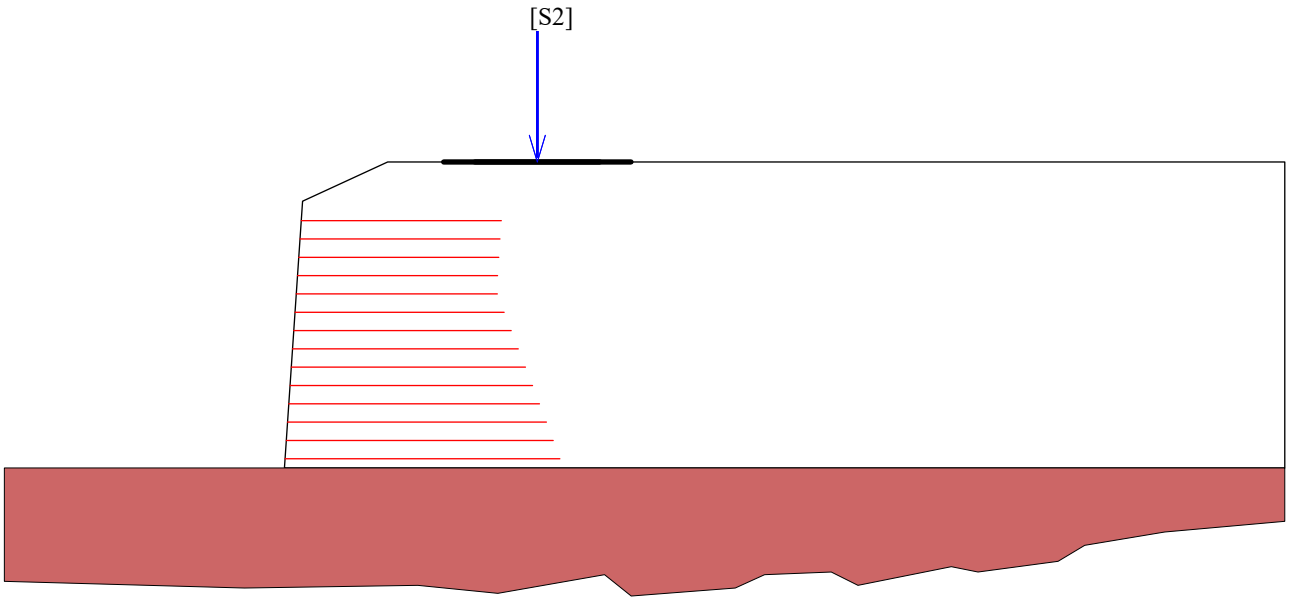
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	6.41	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 6.41 m }
Batter, ω	3.9	[deg]	
Backslope, β	24.7	[deg]	
Backslope rise	0.9	[m]	Broken back equivalent angle, I = 4.19° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00		
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00		
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00		
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00		

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic	
Geogrid:		0.90		0.90

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic	
Geogrid:		0.90		0.90

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77		0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static	Combined Static/Seismic	
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.50
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic	
Reinforced Soil and Foundation	ϕ_τ	0.83		0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77		0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic	
	ϕ_b	0.74		0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

REINFORCEMENT LAYOUT AND DESIGN CRITERIA

LEGEND: (1) Connection strength √ Satisfactory
(2) Geogrid strength ⊗ Unsatisfactory
(3) Pullout resistance
(4) Direct sliding
(5) Eccentricity

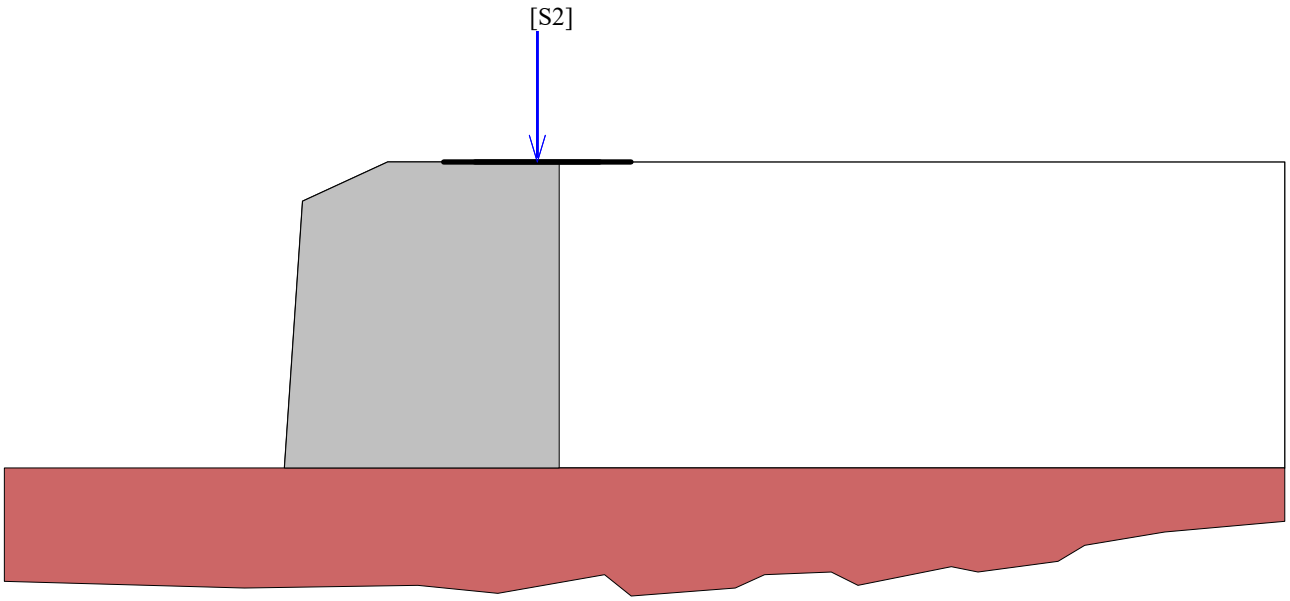
Bearing capacity: √
Foudation Interface: Direct sliding √ Eccentricity √

#	Geogrid Elevation [m]	Length [m]	Type #	(1)	(2)	(3)	(4)	(5)
1	0.22	6.60	1	N/A	√	√	√	√
2	0.66	6.42	1	N/A	√	√	√	√
3	1.10	6.22	1	N/A	√	√	√	√
4	1.54	6.03	1	N/A	√	√	√	√
5	1.98	5.83	1	N/A	√	√	√	√
6	2.42	5.63	1	N/A	√	√	√	√
7	2.86	5.43	1	N/A	√	√	√	√
8	3.30	5.23	1	N/A	√	√	√	√
9	3.74	5.03	1	N/A	√	√	√	√
10	4.18	4.83	1	N/A	√	√	√	√
11	4.62	4.81	1	N/A	√	√	√	√
12	5.06	4.81	1	N/A	√	√	√	√
13	5.50	4.81	1	N/A	√	√	√	√
14	5.94	4.81	1	N/A	√	√	√	√

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for DESIGNED LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	659.3	833.8	[kPa]
Meyerhof stress, σ_V	185.93	176.2	[kPa]
Eccentricity, e	0.46	0.32	[m]
Eccentricity, e/L	0.069	0.048	
CDR calculated	3.55	4.73	
Base length	6.60	6.60	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for DESIGNED LAYOUT
(for GEOGRID reinforcements)

Specified CDR-static = 1.100 and CDR-seismic = 1.100

Along reinforced and foundation soils interface: CDR-static = 1.252 and CDR-seismic = 1.738

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.60	1.101	1.643	1	---RW-95
2	0.66	6.42	1.101	1.628	1	---RW-95
3	1.10	6.22	1.101	1.612	1	---RW-95
4	1.54	6.03	1.101	1.596	1	---RW-95
5	1.98	5.83	1.101	1.580	1	---RW-95
6	2.42	5.63	1.101	1.563	1	---RW-95
7	2.86	5.43	1.101	1.546	1	---RW-95
8	3.30	5.23	1.101	1.529	1	---RW-95
9	3.74	5.03	1.101	1.512	1	---RW-95
10	4.18	4.83	1.101	1.494	1	---RW-95
11	4.62	4.81	1.157	1.550	1	---RW-95
12	5.06	4.81	1.226	1.620	1	---RW-95
13	5.50	4.81	1.302	1.693	1	---RW-95
14	5.94	4.81	1.384	1.767	1	---RW-95

ECCENTRICITY for DESIGNED LAYOUT

At interface with foundation: e/L static = 0.1154, e/L seismic = 0.0923; Overturning: CDR-static = 3.36, CDR-seismic = 3.98

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.60	0.1079	0.0862	1	---RW-95
2	0.66	6.42	0.1040	0.0839	1	---RW-95
3	1.10	6.22	0.0997	0.0810	1	---RW-95
4	1.54	6.03	0.0947	0.0776	1	---RW-95
5	1.98	5.83	0.0890	0.0735	1	---RW-95
6	2.42	5.63	0.0825	0.0685	1	---RW-95
7	2.86	5.43	0.0750	0.0625	1	---RW-95
8	3.30	5.23	0.0664	0.0552	1	---RW-95
9	3.74	5.03	0.0563	0.0465	1	---RW-95
10	4.18	4.83	0.0442	0.0359	1	---RW-95
11	4.62	4.81	0.0220	0.0157	1	---RW-95
12	5.06	4.81	-0.0030	-0.0074	1	---RW-95
13	5.50	4.81	-0.0314	-0.0342	1	---RW-95
14	5.94	4.81	-0.0676	-0.0692	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	17.5	1.9	1.000	1.730	1.000	1.648	---RW-95
2	0.66	30.3	16.4	1.8	1.000	1.848	1.000	1.760	---RW-95
3	1.10	30.3	15.3	1.7	1.000	1.983	1.000	1.888	---RW-95
4	1.54	30.3	14.2	1.6	1.000	2.139	1.000	2.036	---RW-95
5	1.98	30.3	13.0	1.5	1.000	2.321	1.000	2.210	---RW-95
6	2.42	30.3	11.9	1.3	1.000	2.538	1.000	2.416	---RW-95
7	2.86	30.3	10.8	1.2	1.000	2.799	1.000	2.664	---RW-95
8	3.30	30.3	9.7	1.1	1.000	3.120	1.000	2.969	---RW-95
9	3.74	30.3	9.1	1.0	1.000	3.344	1.000	3.190	---RW-95
10	4.18	30.3	8.4	0.9	1.000	3.591	1.000	3.435	---RW-95
11	4.62	30.3	7.4	0.8	1.000	4.105	1.000	3.918	---RW-95
12	5.06	30.3	6.3	0.7	1.000	4.785	1.000	4.552	---RW-95
13	5.50	30.3	5.3	0.7	1.000	5.725	1.000	5.422	---RW-95
14	5.94	30.3	6.2	0.6	1.000	4.857	1.000	4.658	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	17.49	1.95	6.50	0.10	477.8	1.100	27.312	446.7	1.100	22.977
2	0.66	1.000	16.38	1.83	6.10	0.31	429.6	1.100	26.225	401.7	1.100	22.058
3	1.10	1.000	15.27	1.71	5.70	0.52	377.7	1.100	24.740	353.2	1.100	20.804
4	1.54	1.000	14.15	1.59	5.29	0.73	328.6	1.100	23.220	307.3	1.100	19.522
5	1.98	1.000	13.04	1.47	4.89	0.94	282.7	1.100	21.682	264.4	1.100	18.225
6	2.42	1.000	11.93	1.34	4.48	1.15	240.5	1.100	20.160	224.8	1.100	16.943
7	2.86	1.000	10.81	1.22	4.07	1.36	201.4	1.100	18.622	188.3	1.100	15.647
8	3.30	1.000	9.70	1.10	3.66	1.57	165.6	1.100	17.072	154.9	1.100	14.341
9	3.74	1.000	9.05	0.98	3.25	1.78	133.6	1.100	14.759	124.9	1.100	12.459
10	4.18	1.000	8.43	0.85	2.85	1.98	104.9	1.100	12.441	98.0	1.100	10.563
11	4.62	1.000	7.37	0.78	2.61	2.19	85.1	1.100	11.535	79.5	1.100	9.749
12	5.06	1.000	6.33	0.72	2.41	2.40	67.9	1.100	10.735	63.5	1.100	9.010
13	5.50	1.000	5.29	0.66	2.20	2.61	52.6	1.100	9.956	49.2	1.100	8.278
14	5.94	1.000	6.23	0.60	1.99	2.82	39.2	1.100	6.298	36.7	1.100	5.375

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
VK1-km0+850（Combination C）

PROJECT IDENTIFICATION

Title: VK1-km0+850（Combination C）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+850（Combination C）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, c $_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, $\Psi = 61.50°$ (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3360 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3209 Kae (Kh = 0) = 0.3088 Δ Kae = 0.0121 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

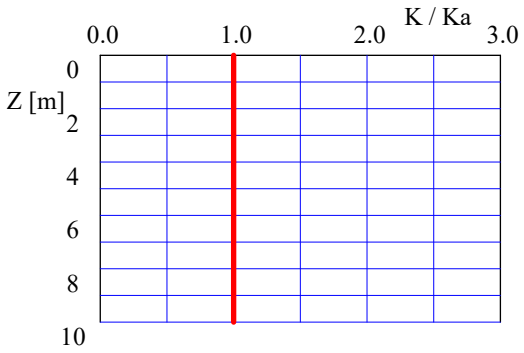
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

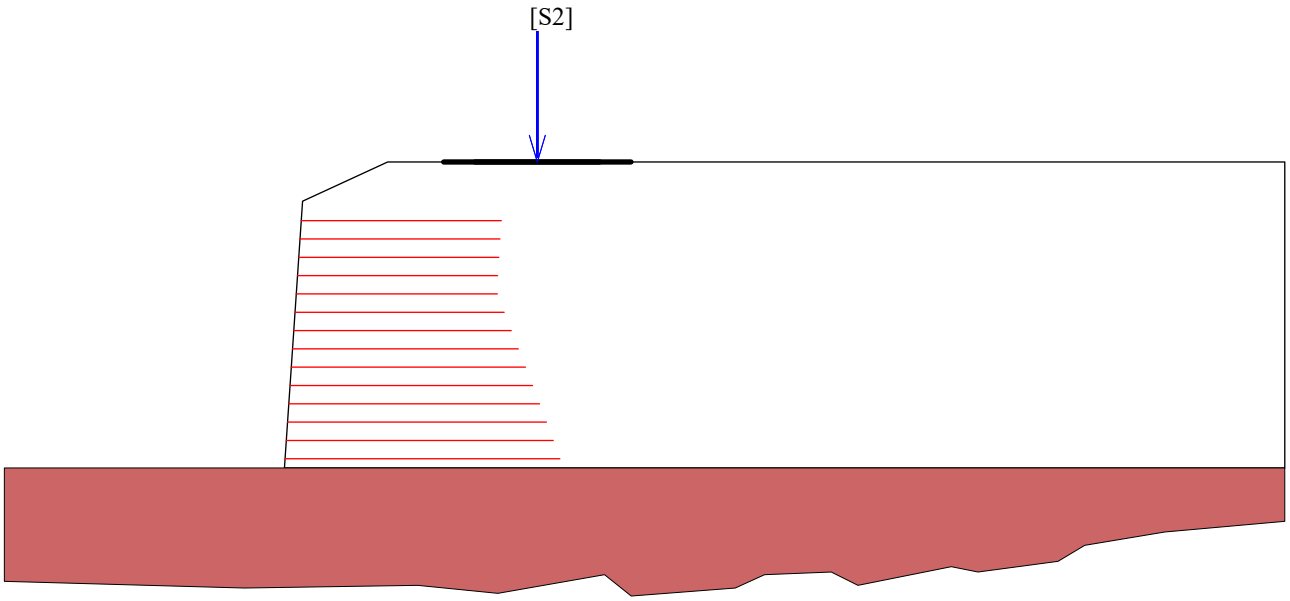
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	6.41	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 6.41 m }
Batter, ω	3.9	[deg]	
Backslope, β	24.7	[deg]	
Backslope rise	0.9	[m]	Broken back equivalent angle, I = 4.19° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 5.6 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	1.00	1.00

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.00
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	1.00	1.00
Reinforced Soil and Reinforcement	ϕ_τ	1.00	1.00

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:	Static	Combined Static/Seismic
ϕ_b	1.00	1.00

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 5.40, Meyerhof stress = 173.65 kPa.
Foundation Interface: Direct sliding, CDR = 2.023, Eccentricity, e/L = 0.0850, CDR-overturning = 4.20

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.60	1	N/A	N/A	N/A	1.730	35.470	1.912	0.0794	---RW-95
2	0.66	6.42	1	N/A	N/A	N/A	1.848	34.059	1.890	0.0776	---RW-95
3	1.10	6.22	1	N/A	N/A	N/A	1.983	32.130	1.867	0.0752	---RW-95
4	1.54	6.03	1	N/A	N/A	N/A	2.139	30.156	1.844	0.0723	---RW-95
5	1.98	5.83	1	N/A	N/A	N/A	2.321	28.158	1.821	0.0687	---RW-95
6	2.42	5.63	1	N/A	N/A	N/A	2.538	26.181	1.797	0.0642	---RW-95
7	2.86	5.43	1	N/A	N/A	N/A	2.799	24.184	1.772	0.0589	---RW-95
8	3.30	5.23	1	N/A	N/A	N/A	3.120	22.171	1.746	0.0523	---RW-95
9	3.74	5.03	1	N/A	N/A	N/A	3.344	19.168	1.719	0.0443	---RW-95
10	4.18	4.83	1	N/A	N/A	N/A	3.591	16.157	1.691	0.0343	---RW-95
11	4.62	4.81	1	N/A	N/A	N/A	4.105	14.981	1.748	0.0147	---RW-95
12	5.06	4.81	1	N/A	N/A	N/A	4.785	13.942	1.819	-0.0079	---RW-95
13	5.50	4.81	1	N/A	N/A	N/A	5.725	12.930	1.893	-0.0344	---RW-95
14	5.94	4.81	1	N/A	N/A	N/A	4.857	8.180	1.968	-0.0692	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

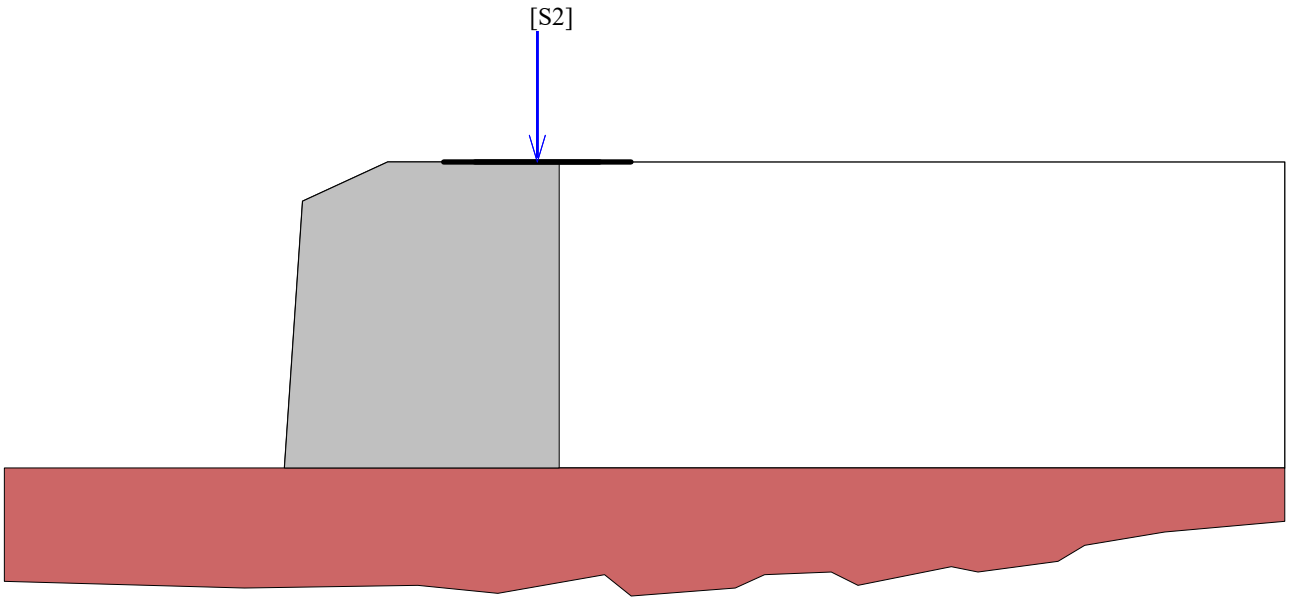
Bearing capacity, CDR = 5.26, Meyerhof stress = 176.21 kPa.
Foundation Interface: Direct sliding, CDR = 1.931, Eccentricity, e/L = 0.0923, Fs-overturning = 3.98

GEOGRID #	Elevation [m]	Length [m]	Type #	CONNECTION CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.60	1	N/A	N/A	N/A	1.831	25.530	1.826	0.0862	---RW-95
2	0.66	6.42	1	N/A	N/A	N/A	1.955	24.509	1.809	0.0839	---RW-95
3	1.10	6.22	1	N/A	N/A	N/A	2.098	23.116	1.791	0.0810	---RW-95
4	1.54	6.03	1	N/A	N/A	N/A	2.262	21.691	1.774	0.0776	---RW-95
5	1.98	5.83	1	N/A	N/A	N/A	2.455	20.250	1.755	0.0735	---RW-95
6	2.42	5.63	1	N/A	N/A	N/A	2.684	18.825	1.737	0.0685	---RW-95
7	2.86	5.43	1	N/A	N/A	N/A	2.960	17.385	1.718	0.0625	---RW-95
8	3.30	5.23	1	N/A	N/A	N/A	3.299	15.934	1.699	0.0552	---RW-95
9	3.74	5.03	1	N/A	N/A	N/A	3.545	13.843	1.680	0.0465	---RW-95
10	4.18	4.83	1	N/A	N/A	N/A	3.817	11.737	1.660	0.0359	---RW-95
11	4.62	4.81	1	N/A	N/A	N/A	4.354	10.833	1.723	0.0157	---RW-95
12	5.06	4.81	1	N/A	N/A	N/A	5.058	10.012	1.801	-0.0074	---RW-95
13	5.50	4.81	1	N/A	N/A	N/A	6.024	9.198	1.881	-0.0342	---RW-95
14	5.94	4.81	1	N/A	N/A	N/A	5.175	5.972	1.963	-0.0692	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	937.4	926.4	[kPa]
Meyerhof stress, σ_V	173.65	176.2	[kPa]
Eccentricity, e	0.28	0.32	[m]
Eccentricity, e/L	0.042	0.048	
CDR calculated	5.40	5.26	
Base length	6.60	6.60	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 2.023 and CDR-seismic = 1.931

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.60	1.912	1.826	1	---RW-95
2	0.66	6.42	1.890	1.809	1	---RW-95
3	1.10	6.22	1.867	1.791	1	---RW-95
4	1.54	6.03	1.844	1.774	1	---RW-95
5	1.98	5.83	1.821	1.755	1	---RW-95
6	2.42	5.63	1.797	1.737	1	---RW-95
7	2.86	5.43	1.772	1.718	1	---RW-95
8	3.30	5.23	1.746	1.699	1	---RW-95
9	3.74	5.03	1.719	1.680	1	---RW-95
10	4.18	4.83	1.691	1.660	1	---RW-95
11	4.62	4.81	1.748	1.723	1	---RW-95
12	5.06	4.81	1.819	1.801	1	---RW-95
13	5.50	4.81	1.893	1.881	1	---RW-95
14	5.94	4.81	1.968	1.963	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0850, e/L seismic = 0.0923; Overturning: CDR-static = 4.20, CDR-seismic = 3.98

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.60	0.0794	0.0862	1	---RW-95
2	0.66	6.42	0.0776	0.0839	1	---RW-95
3	1.10	6.22	0.0752	0.0810	1	---RW-95
4	1.54	6.03	0.0723	0.0776	1	---RW-95
5	1.98	5.83	0.0687	0.0735	1	---RW-95
6	2.42	5.63	0.0642	0.0685	1	---RW-95
7	2.86	5.43	0.0589	0.0625	1	---RW-95
8	3.30	5.23	0.0523	0.0552	1	---RW-95
9	3.74	5.03	0.0443	0.0465	1	---RW-95
10	4.18	4.83	0.0343	0.0359	1	---RW-95
11	4.62	4.81	0.0147	0.0157	1	---RW-95
12	5.06	4.81	-0.0079	-0.0074	1	---RW-95
13	5.50	4.81	-0.0344	-0.0342	1	---RW-95
14	5.94	4.81	-0.0692	-0.0692	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	30.3	17.49	1.95	N/A	1.730	N/A	1.831	---RW-95
2	0.66	30.3	16.38	1.83	N/A	1.848	N/A	1.955	---RW-95
3	1.10	30.3	15.27	1.71	N/A	1.983	N/A	2.098	---RW-95
4	1.54	30.3	14.15	1.59	N/A	2.139	N/A	2.262	---RW-95
5	1.98	30.3	13.04	1.47	N/A	2.321	N/A	2.455	---RW-95
6	2.42	30.3	11.93	1.34	N/A	2.538	N/A	2.684	---RW-95
7	2.86	30.3	10.81	1.22	N/A	2.799	N/A	2.960	---RW-95
8	3.30	30.3	9.70	1.10	N/A	3.120	N/A	3.299	---RW-95
9	3.74	30.3	9.05	0.98	N/A	3.344	N/A	3.545	---RW-95
10	4.18	30.3	8.43	0.85	N/A	3.591	N/A	3.817	---RW-95
11	4.62	30.3	7.37	0.78	N/A	4.105	N/A	4.354	---RW-95
12	5.06	30.3	6.33	0.72	N/A	4.785	N/A	5.058	---RW-95
13	5.50	30.3	5.29	0.66	N/A	5.725	N/A	6.024	---RW-95
14	5.94	30.3	6.23	0.60	N/A	4.857	N/A	5.175	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	17.49	1.95	6.50	0.10	620.5	N/A	35.470	496.4	N/A	25.530
2	0.66	1.000	16.38	1.83	6.10	0.31	557.9	N/A	34.059	446.3	N/A	24.509
3	1.10	1.000	15.27	1.71	5.70	0.52	490.5	N/A	32.130	392.4	N/A	23.116
4	1.54	1.000	14.15	1.59	5.29	0.73	426.8	N/A	30.156	341.4	N/A	21.691
5	1.98	1.000	13.04	1.47	4.89	0.94	367.2	N/A	28.158	293.8	N/A	20.250
6	2.42	1.000	11.93	1.34	4.48	1.15	312.3	N/A	26.181	249.8	N/A	18.825
7	2.86	1.000	10.81	1.22	4.07	1.36	261.5	N/A	24.184	209.2	N/A	17.385
8	3.30	1.000	9.70	1.10	3.66	1.57	215.1	N/A	22.171	172.1	N/A	15.934
9	3.74	1.000	9.05	0.98	3.25	1.78	173.5	N/A	19.168	138.8	N/A	13.843
10	4.18	1.000	8.43	0.85	2.85	1.98	136.2	N/A	16.157	108.9	N/A	11.737
11	4.62	1.000	7.37	0.78	2.61	2.19	110.5	N/A	14.981	88.4	N/A	10.833
12	5.06	1.000	6.33	0.72	2.41	2.40	88.2	N/A	13.942	70.6	N/A	10.012
13	5.50	1.000	5.29	0.66	2.20	2.61	68.4	N/A	12.930	54.7	N/A	9.198
14	5.94	1.000	6.23	0.60	1.99	2.82	51.0	N/A	8.180	40.8	N/A	5.972

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

Version 3.0 ReSSA Version 3.0

0+850 overall stability（no seismicity）

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title: 0+850 overall stability（no seismicity）
Project Number: -
Client:
Designer: 戴征杰（BOSTD）

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name:
Original date and time of creating this file: Fri Mar 26 10:21:49 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m^3	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
.1....... Reinforced Soil..................................	19.5	33.0	0.0
.2....... Retained Soil......................................	19.5	30.0	0.0
.3....... Foundation Soil..................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

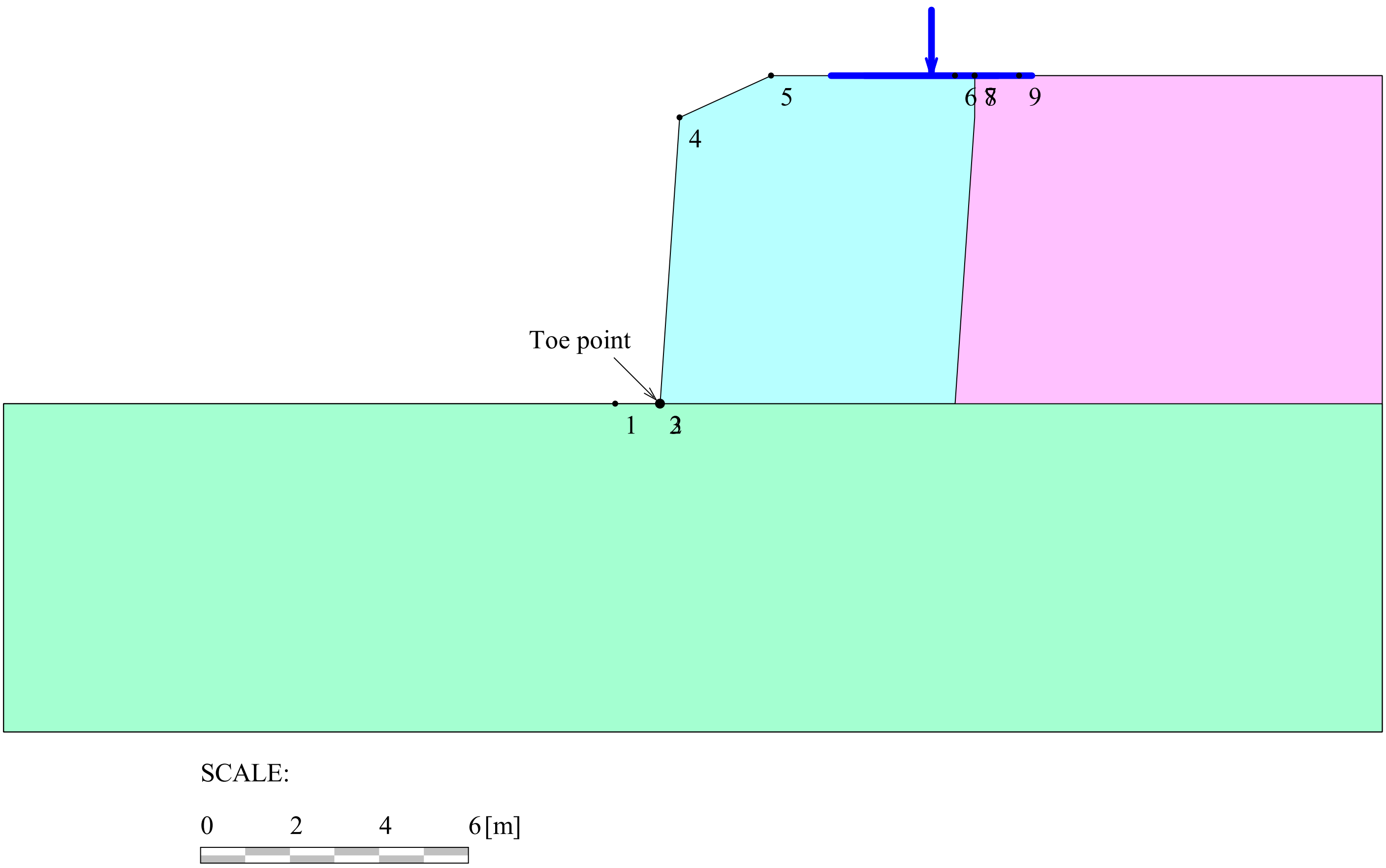
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1....................................None
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

Strip Load #1.. 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 6.08 [m]
Strip Load #2.. 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 6.08 [m]



Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.44	6.41
	5	2.49	7.35
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	6.61	0.00
	10	7.05	6.41
	11	7.05	7.35
	12	8.04	7.35
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

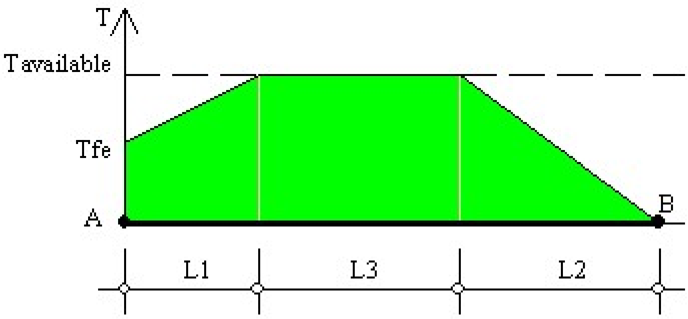
#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.44	6.41	0.00	0.00
5	2.49	7.35	0.00	0.00
6	6.61	7.35	0.00	0.00
7	7.05	7.35	6.41	0.00
8	7.05	7.35	7.35	0.00
9	8.04	7.35	7.35	0.00

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---RW-95	0.22	6.60	0.00	0.53	6.07	33.63	33.63
2	---RW-95	0.66	6.42	0.00	0.56	5.86	33.63	33.63
3	---RW-95	1.10	6.22	0.00	0.60	5.62	33.63	33.63
4	---RW-95	1.54	6.03	0.00	0.64	5.39	33.63	33.63
5	---RW-95	1.98	5.83	0.00	0.70	5.13	33.63	33.63
6	---RW-95	2.42	5.63	0.00	0.76	4.87	33.63	33.63
7	---RW-95	2.86	5.43	0.00	0.83	4.60	33.63	33.63
8	---RW-95	3.30	5.23	0.00	0.92	4.31	33.63	33.63
9	---RW-95	3.74	5.03	0.00	1.03	4.00	33.63	33.63
10	---RW-95	4.18	4.83	0.00	1.18	3.65	33.63	33.63
11	---RW-95	4.62	4.81	0.00	1.37	3.44	33.63	33.63
12	---RW-95	5.06	4.81	0.00	1.63	3.18	33.63	33.63
13	---RW-95	5.50	4.81	0.00	2.01	2.80	33.63	33.63
14	---RW-95	5.94	4.81	0.00	2.64	2.17	33.63	33.63

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc.   www.GeoPrograms.com   License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	4.50	7.35	-8.03	0.02	-3.92	7.36	8.42	7.15	
2	5.55	7.35	-8.07	0.04	-3.22	7.36	8.77	2.53	
3	6.60	7.35	-6.53	0.08	-1.98	7.36	8.58	1.81	
4	7.65	7.35	-5.75	0.09	-1.10	7.50	8.75	1.57	
. 5	8.70	7.35	-5.68	0.06	-0.39	7.44	9.09	1.53 .	OK
6	9.75	7.35	-6.49	0.06	-0.41	8.25	10.20	1.53	
7	10.80	7.35	-6.59	0.13	-0.08	9.02	11.01	1.54	
8	11.85	7.35	-6.51	0.07	-0.05	10.57	12.33	1.57	
9	12.90	7.35	-7.29	0.05	-0.45	12.70	14.38	1.61	
10	13.95	7.35	-8.04	0.02	-0.90	15.23	16.81	1.67	
11	15.00	7.35	-8.17	0.07	-0.92	17.52	18.89	1.74	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

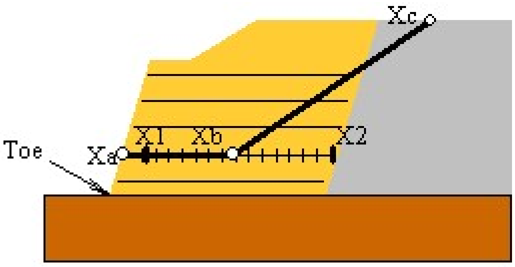
Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-8.11	0.08	10.80	7.35	-0.86	9.47	11.86	1.55	
2	-7.36	0.12	9.75	7.35	-0.81	8.48	10.62	1.54	
3	-6.41	0.01	8.70	7.35	-0.81	7.70	9.51	1.53	
. 4	-5.68	0.06	8.70	7.35	-0.39	7.44	9.09	1.53 .	OK
5	-4.94	0.09	8.70	7.35	-0.12	7.48	8.83	1.54	
6	-4.00	0.00	8.70	7.35	0.15	7.48	8.55	1.56	
7	-3.35	0.07	8.70	7.35	0.34	7.58	8.37	1.61	
8	-2.50	0.04	8.70	7.35	0.62	7.49	8.08	1.67	
9	-1.62	0.01	8.70	7.35	0.73	7.63	7.97	1.73	
10	-0.80	0.00	8.70	7.35	0.37	8.31	8.39	1.82	
11	-0.00	0.00	8.70	7.35	0.15	8.65	8.65	1.85	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	7.81	7.35	1.37	Minimum on Edge
Reinf. Layer #1	0.22	0.02	0.22	0.10	0.22	7.75	7.35	1.43	Minimum on Edge
Reinf. Layer #2	0.66	0.05	0.66	0.10	0.66	7.80	7.35	1.49	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	0.20	1.10	7.65	7.35	1.54	Minimum on Edge
Reinf. Layer #4	1.54	0.11	1.54	1.38	1.54	8.06	7.35	1.60	OK
Reinf. Layer #5	1.98	0.14	1.98	1.34	1.98	7.97	7.35	1.65	OK
Reinf. Layer #6	2.42	0.17	2.42	3.59	2.42	8.35	7.35	1.70	OK
Reinf. Layer #7	2.86	0.20	2.86	4.53	2.86	8.30	7.35	1.66	OK
Reinf. Layer #8	3.30	0.23	3.30	4.37	3.30	7.77	7.35	1.64	OK
Reinf. Layer #9	3.74	0.26	3.74	4.31	3.74	7.56	7.35	1.62	OK
Reinf. Layer #10	4.18	0.29	4.18	4.15	4.18	7.55	7.35	1.64	OK
Reinf. Layer #11	4.62	0.32	4.62	4.15	4.62	7.29	7.35	1.67	OK
Reinf. Layer #12	5.06	0.35	5.06	5.09	5.06	7.38	7.35	1.72	Minimum on Edge
Reinf. Layer #13	5.50	0.38	5.50	4.25	5.50	6.24	7.35	1.73	OK
Reinf. Layer #14	5.94	0.41	5.94	4.25	5.94	5.76	7.35	1.72	OK

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.53
Critical Circle: Xc = -0.39[m], Yc = 7.44[m], R = 9.09[m]. (Number of slices used = 58)

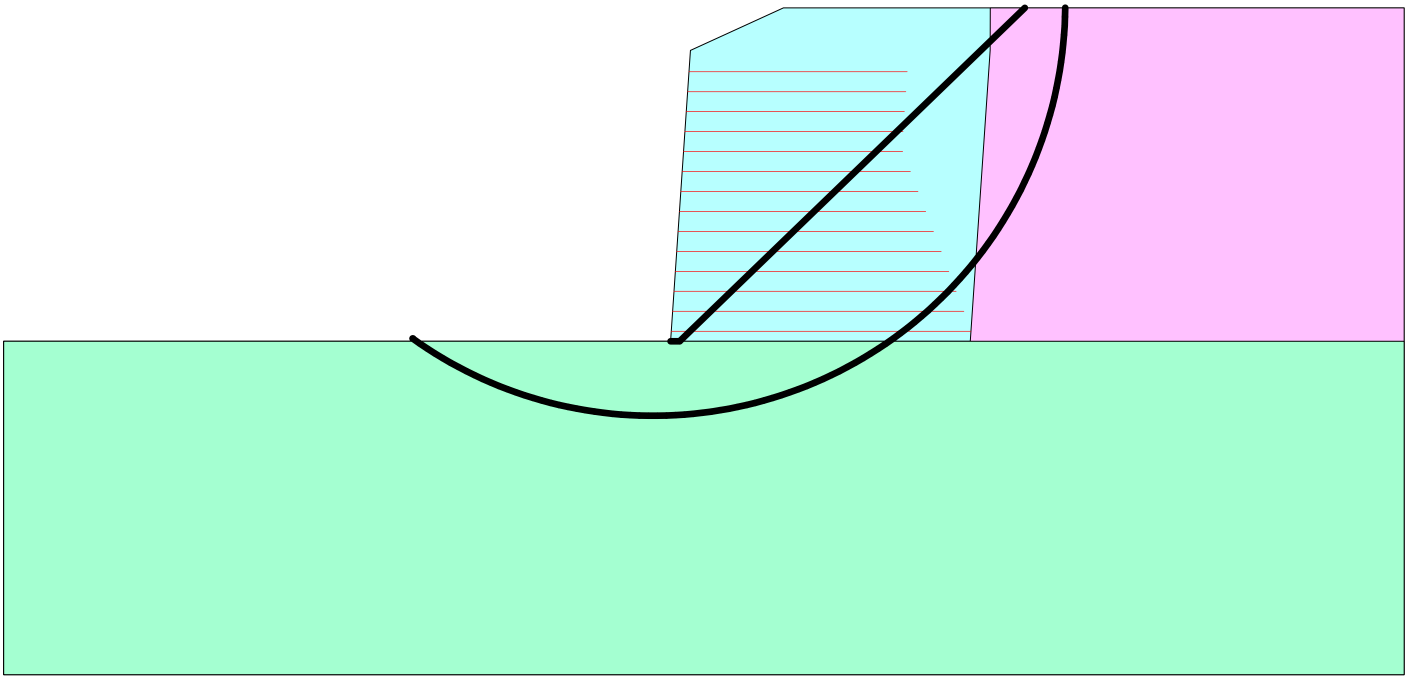
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

Minimum Factor of Safety = 1.37
Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [m]
(Xb = 0.20, Yb = 0.00) [m]
(Xc = 7.81, Yc = 7.35) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 43.96 [degrees]

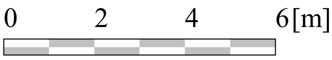
Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

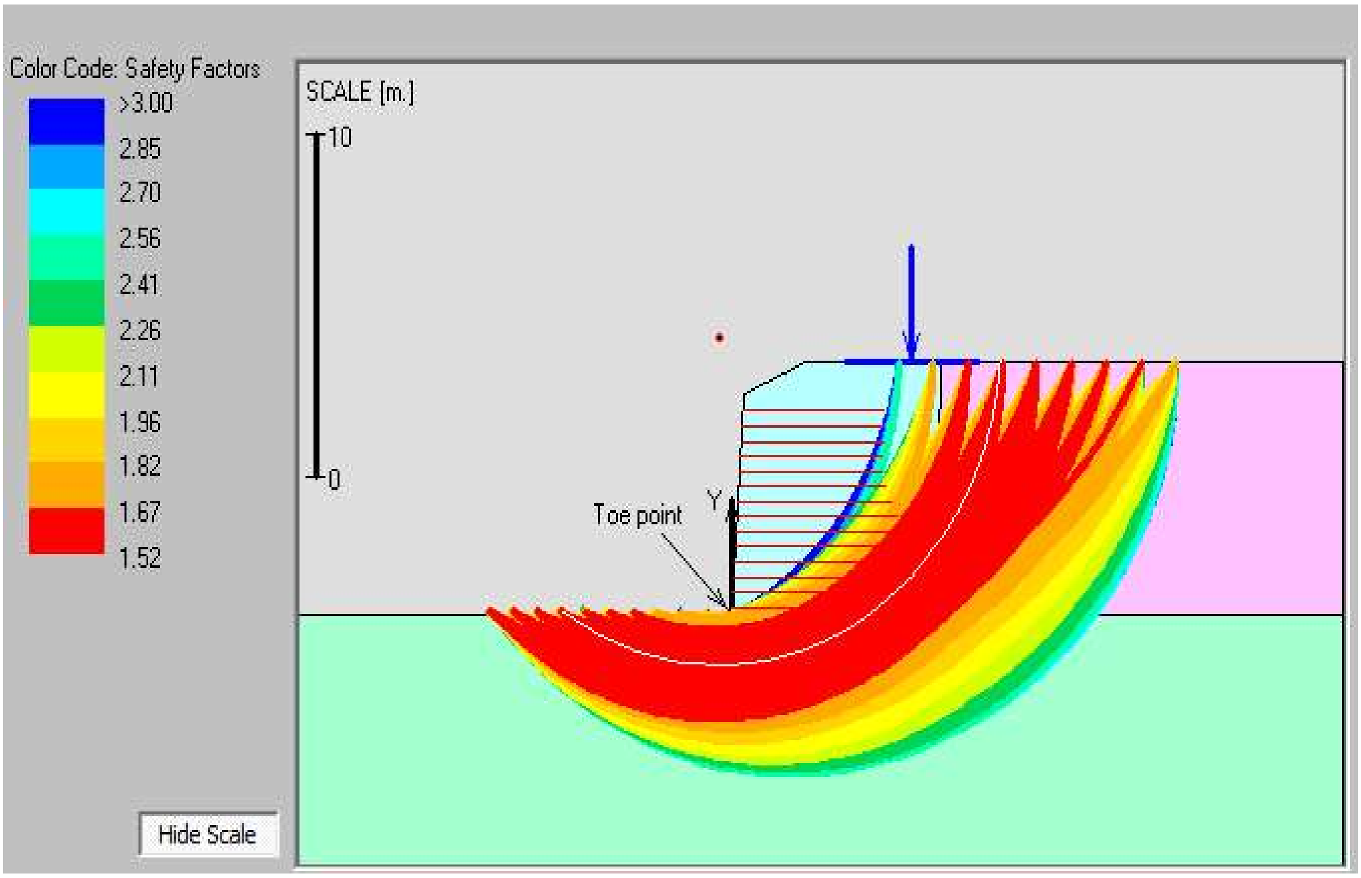


Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE

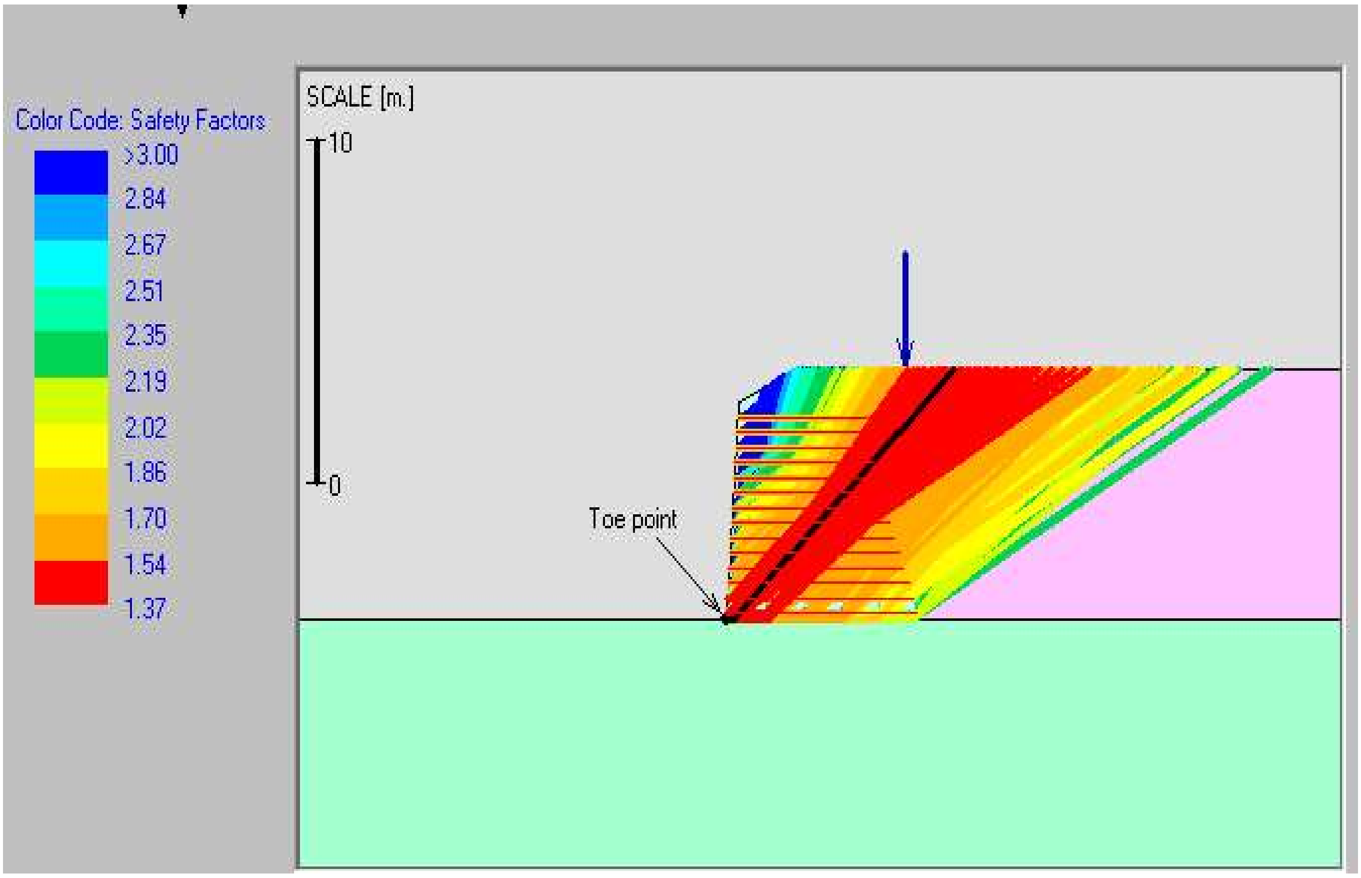


Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc.　　www.GeoPrograms.com　　License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

0+850 overall stability(seismicity)

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title: 0+850 overall stability(seismicity)
Project Number: -
Client:
Designer: 戴征杰（BOSTD）

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #
Fax #:
E-Mail:

Original file path and name:
Original date and time of creating this file: Fri Mar 26 10:21:49 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m ^{3}	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
1....... Reinforced Soil..................................	19.5	33.0	0.0
2....... Retained Soil......................................	19.5	30.0	0.0
3....... Foundation Soil..................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Horizontal peak ground acceleration coefficient, Ao = 0.140
Design horizontal seismic coefficient, kh = Am = 0.50 x Ao = 0.070 & design vertical seismic coefficient, kv (down) = 0.000 x kh = 0.000

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

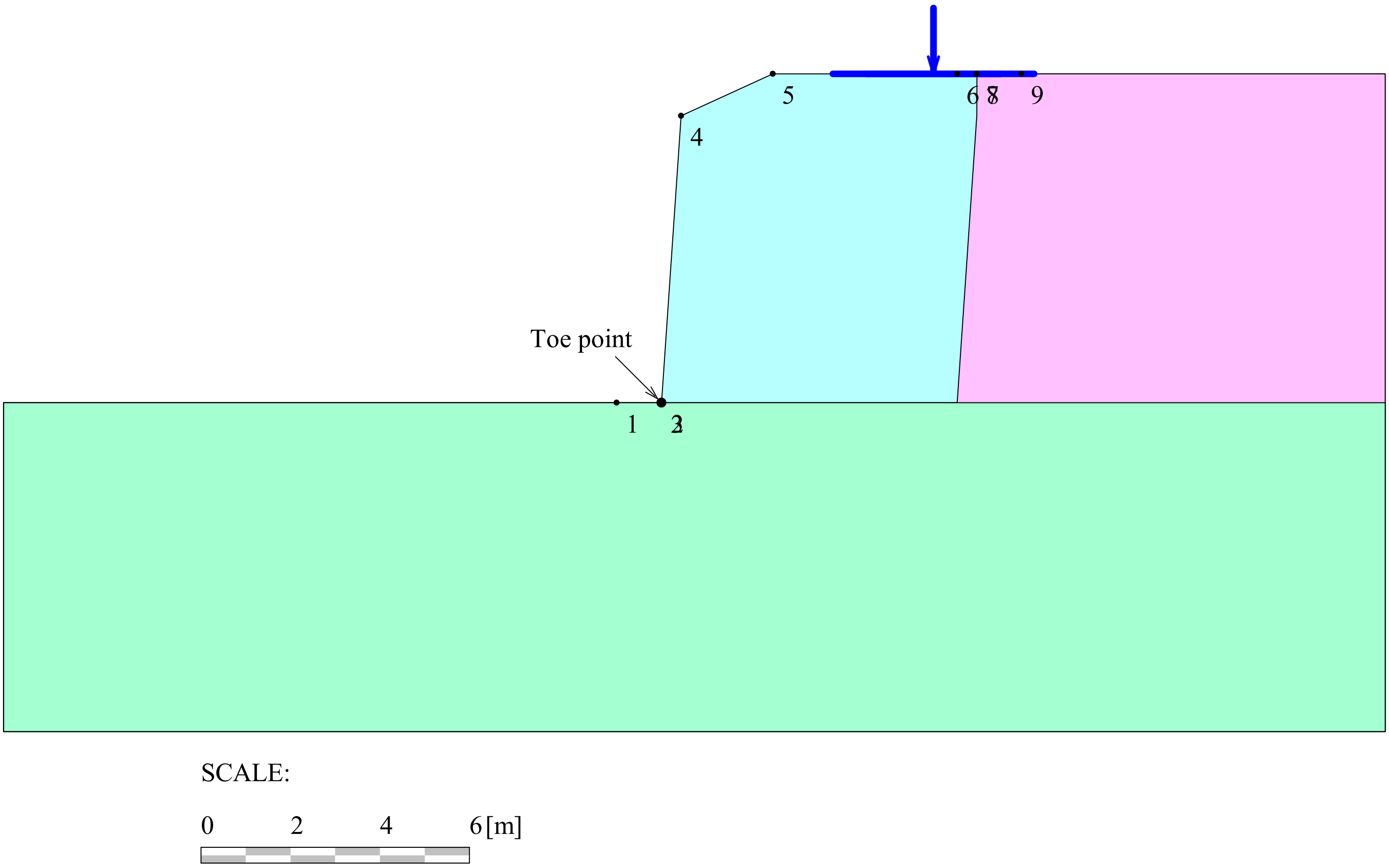
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1....................................None
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

Strip Load #1.. 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 6.08 [m]
Strip Load #2.. 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 6.08 [m]



Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.44	6.41
	5	2.49	7.35
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	6.61	0.00
	10	7.05	6.41
	11	7.05	7.35
	12	8.04	7.35
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF SPECIFIED GEOMETRY

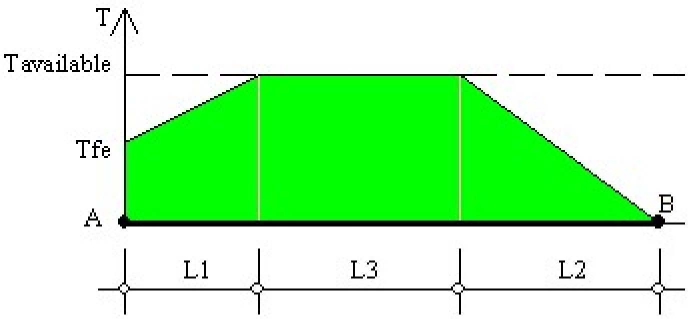
Soil profile contains 3 layers. Coordinates in [m.]

#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.44	6.41	0.00	0.00
5	2.49	7.35	0.00	0.00
6	6.61	7.35	0.00	0.00
7	7.05	7.35	6.41	0.00
8	7.05	7.35	7.35	0.00
9	8.04	7.35	7.35	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---RW-95	0.22	6.60	0.00	0.53	6.07	33.63	33.63
2	---RW-95	0.66	6.42	0.00	0.56	5.86	33.63	33.63
3	---RW-95	1.10	6.22	0.00	0.60	5.62	33.63	33.63
4	---RW-95	1.54	6.03	0.00	0.64	5.39	33.63	33.63
5	---RW-95	1.98	5.83	0.00	0.70	5.13	33.63	33.63
6	---RW-95	2.42	5.63	0.00	0.76	4.87	33.63	33.63
7	---RW-95	2.86	5.43	0.00	0.83	4.60	33.63	33.63
8	---RW-95	3.30	5.23	0.00	0.92	4.31	33.63	33.63
9	---RW-95	3.74	5.03	0.00	1.03	4.00	33.63	33.63
10	---RW-95	4.18	4.83	0.00	1.18	3.65	33.63	33.63
11	---RW-95	4.62	4.81	0.00	1.37	3.44	33.63	33.63
12	---RW-95	5.06	4.81	0.00	1.63	3.18	33.63	33.63
13	---RW-95	5.50	4.81	0.00	2.01	2.80	33.63	33.63
14	---RW-95	5.94	4.81	0.00	2.64	2.17	33.63	33.63

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.)
The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	4.50	7.35	-8.03	0.02	-3.92	7.36	8.42	5.58	
2	5.55	7.35	-8.07	0.04	-3.22	7.36	8.77	2.24	
3	6.60	7.35	-6.53	0.08	-1.98	7.36	8.58	1.65	
4	7.65	7.35	-6.50	0.07	-1.44	7.63	9.10	1.44	
5	8.70	7.35	-6.41	0.01	-0.81	7.70	9.51	1.40	
6	9.75	7.35	-6.49	0.06	-0.41	8.25	10.20	1.39	
. 7	10.80	7.35	-7.28	0.05	-0.85	10.16	11.98	1.39 .	OK
8	11.85	7.35	-7.38	0.11	-0.54	11.09	12.94	1.40	
9	12.90	7.35	-8.14	0.08	-0.82	12.96	14.82	1.42	
10	13.95	7.35	-8.04	0.02	-0.90	15.23	16.81	1.46	
11	15.00	7.35	-8.17	0.07	-0.92	17.52	18.89	1.50	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.
****
Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.)
The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-8.11	0.08	10.80	7.35	-0.86	9.47	11.86	1.40	
. 2	-7.28	0.05	10.80	7.35	-0.85	10.16	11.98	1.39 .	OK
3	-6.40	0.00	10.80	7.35	-0.17	9.23	11.13	1.39	
4	-5.60	0.00	9.75	7.35	0.00	8.00	9.77	1.40	
5	-4.87	0.04	9.75	7.35	0.34	7.91	9.43	1.41	
6	-4.01	0.00	8.70	7.35	-0.03	7.79	8.74	1.44	
7	-3.35	0.07	8.70	7.35	0.34	7.58	8.37	1.48	
8	-2.50	0.04	8.70	7.35	0.33	7.93	8.39	1.53	
9	-1.62	0.01	8.70	7.35	0.73	7.63	7.97	1.59	
10	-0.80	0.00	8.70	7.35	0.24	8.47	8.54	1.65	
11	-0.00	0.00	8.70	7.35	0.15	8.65	8.65	1.68	

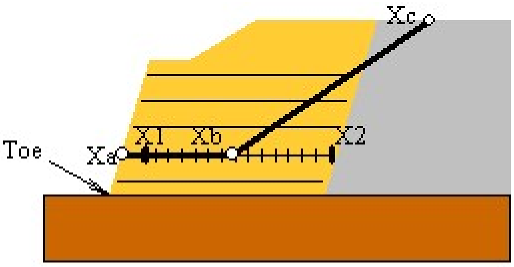
Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	8.66	7.35	1.28	Minimum on Edge
Reinf. Layer #1	0.22	0.02	0.22	0.10	0.22	8.30	7.35	1.34	Minimum on Edge
Reinf. Layer #2	0.66	0.05	0.66	0.10	0.66	8.36	7.35	1.39	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	1.42	1.10	8.87	7.35	1.43	OK
Reinf. Layer #4	1.54	0.11	1.54	1.38	1.54	8.30	7.35	1.46	OK
Reinf. Layer #5	1.98	0.14	1.98	3.61	1.98	8.80	7.35	1.50	OK
Reinf. Layer #6	2.42	0.17	2.42	4.69	2.42	8.98	7.35	1.50	OK
Reinf. Layer #7	2.86	0.20	2.86	4.53	2.86	8.30	7.35	1.46	OK
Reinf. Layer #8	3.30	0.23	3.30	4.37	3.30	7.77	7.35	1.45	OK
Reinf. Layer #9	3.74	0.26	3.74	4.31	3.74	7.56	7.35	1.44	OK
Reinf. Layer #10	4.18	0.29	4.18	4.15	4.18	7.55	7.35	1.47	OK
Reinf. Layer #11	4.62	0.32	4.62	5.09	4.62	7.55	7.35	1.49	Minimum on Edge
Reinf. Layer #12	5.06	0.35	5.06	5.09	5.06	7.38	7.35	1.53	Minimum on Edge
Reinf. Layer #13	5.50	0.38	5.50	4.25	5.50	6.17	7.35	1.55	OK
Reinf. Layer #14	5.94	0.41	5.94	4.25	5.94	5.71	7.35	1.54	OK

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.39
Critical Circle: Xc = -0.85[m], Yc = 10.16[m], R = 11.98[m]. (Number of slices used = 58)

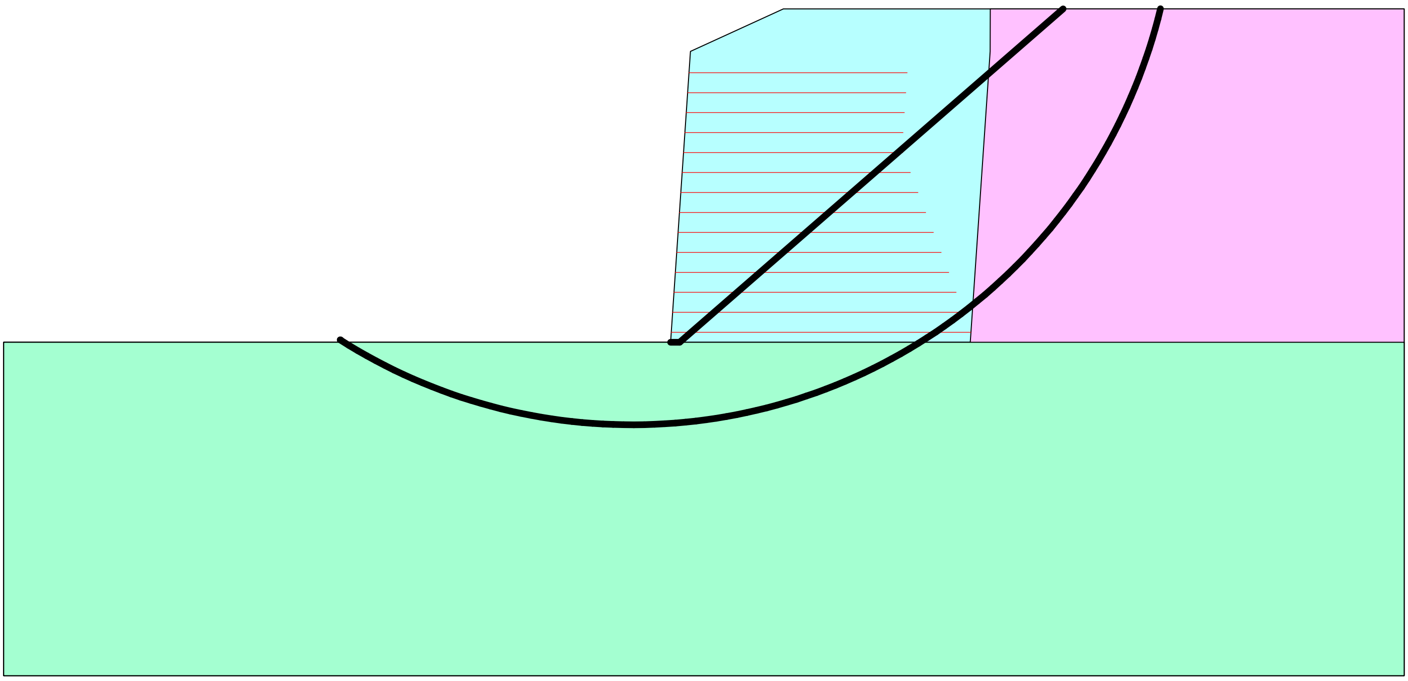
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

Minimum Factor of Safety = 1.28
Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [m]
(Xb = 0.20, Yb = 0.00) [m]
(Xc = 8.66, Yc = 7.35) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 40.97 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING

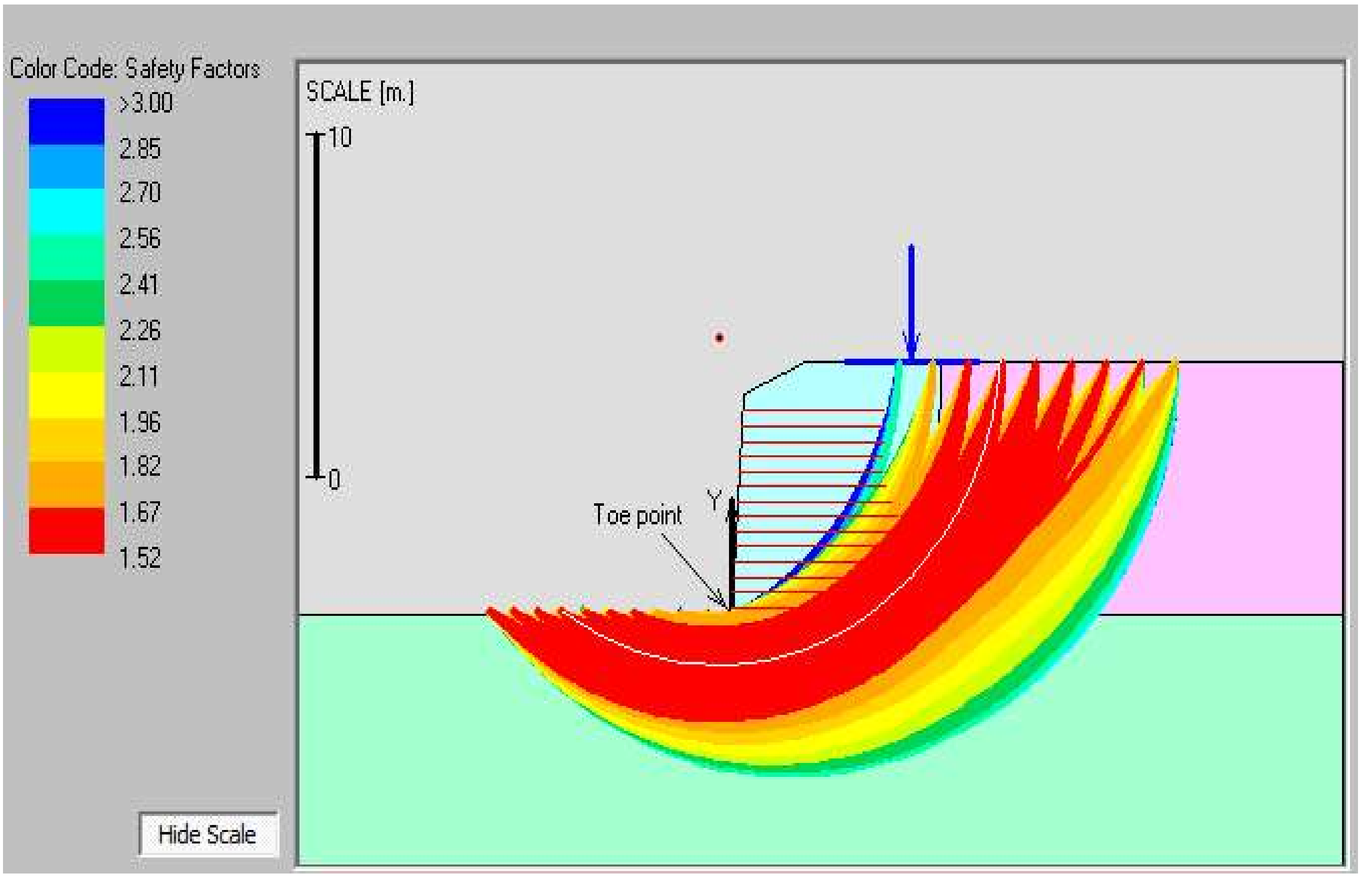


SCALE:

0 2 4 6[m]

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

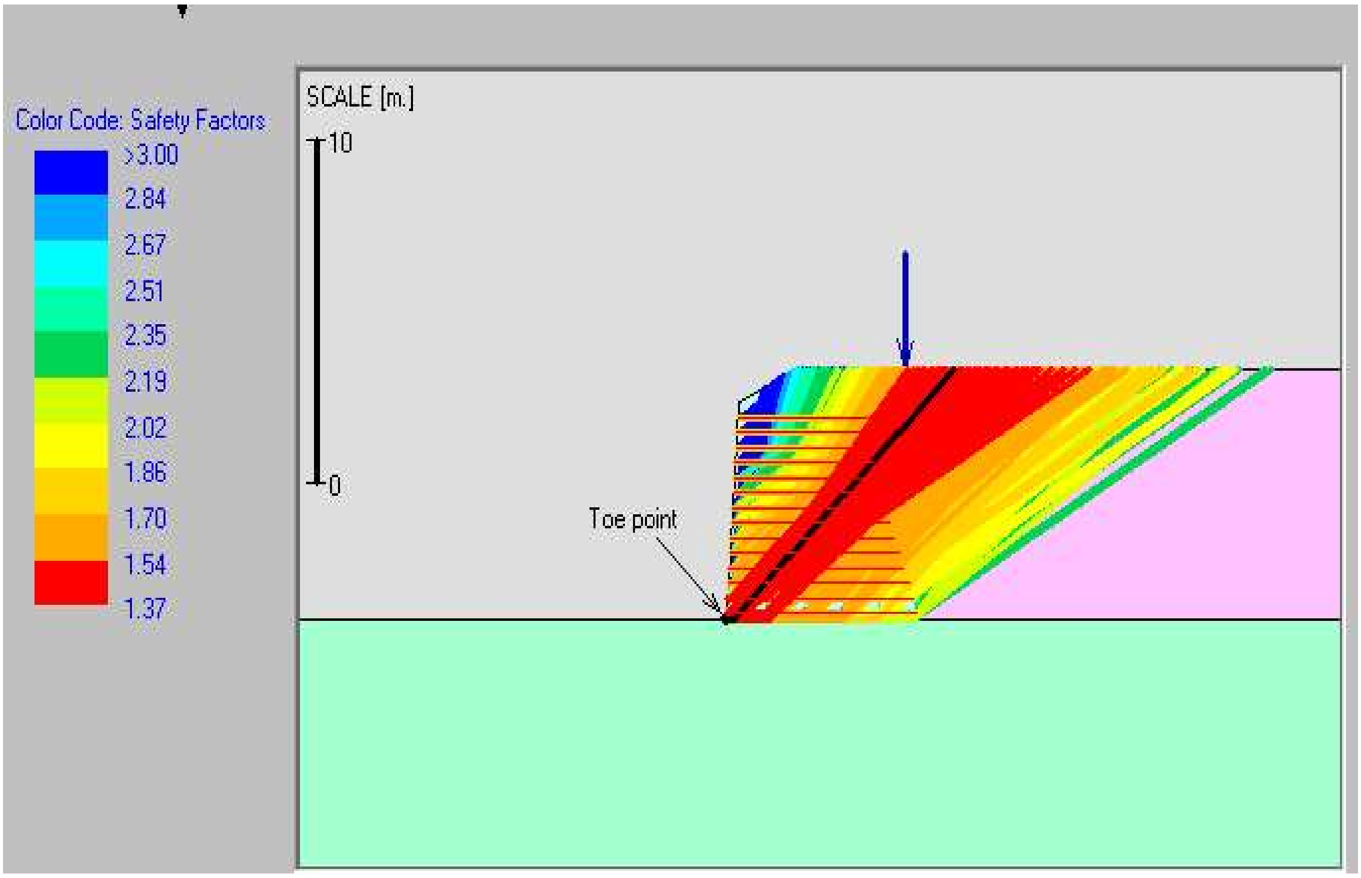
SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

AASHTO 2007 (LRFD)
VK1-km0+875（Combination A）

PROJECT IDENTIFICATION

Title: VK1-km0+875（Combination A）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+875（Combination A）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, Ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3345 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3197 Kae (Kh = 0) = 0.3079 Δ Kae = 0.0117 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

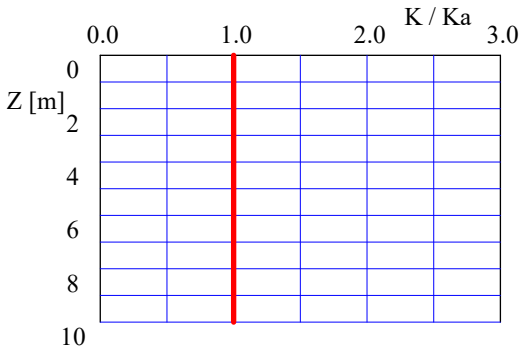
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

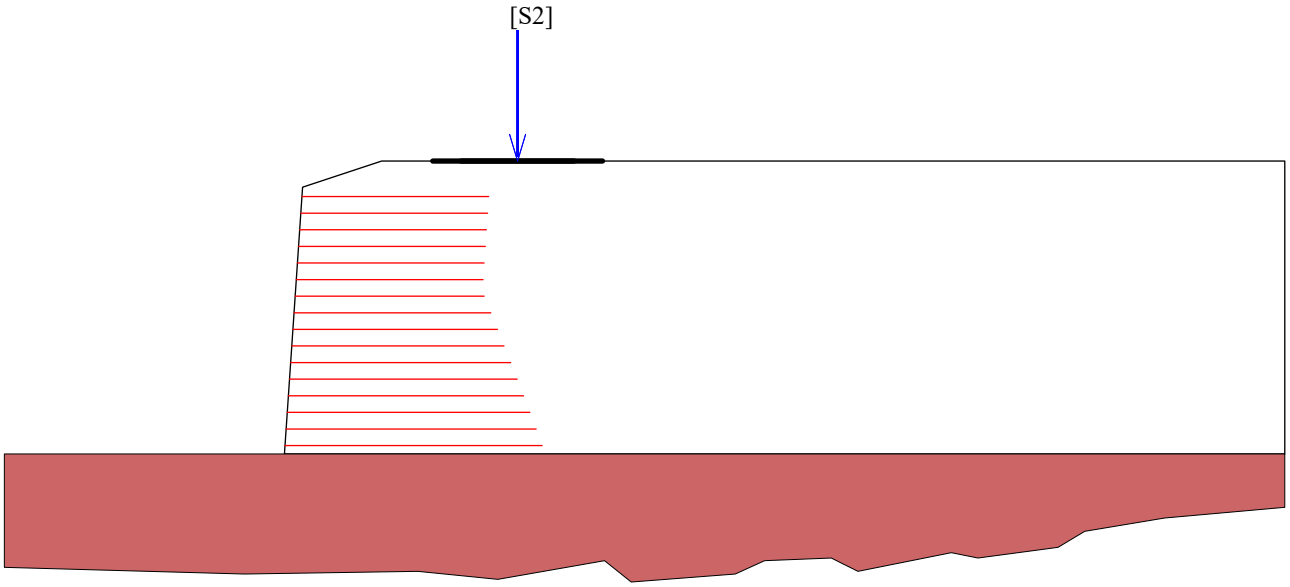
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	7.07	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 7.07 m }
Batter, ω	3.9	[deg]	
Backslope, β	18.2	[deg]	
Backslope rise	0.7	[m]	Broken back equivalent angle, I = 2.79° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 5.7 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 5.7 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.50
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.50
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.50

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77	0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.50	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.50
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.50

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	0.83	0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77	0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:	Static	Combined Static/Seismic
ϕ_b	0.74	0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 2.54, Meyerhof stress = 276.92 kPa.

Foundation Interface: Direct sliding, CDR = 1.620, Eccentricity, e/L = 0.0947, CDR-overturning = 4.09

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.82	2	N/A	N/A	N/A	1.487	18.639	1.471	0.0893	---RW-125
2	0.66	6.63	2	N/A	N/A	N/A	1.581	17.926	1.454	0.0883	---RW-125
3	1.10	6.43	2	N/A	N/A	N/A	1.654	16.595	1.436	0.0869	---RW-125
4	1.54	6.24	1	N/A	N/A	N/A	1.258	15.226	1.419	0.0851	---RW-95
5	1.98	6.03	1	N/A	N/A	N/A	1.349	14.140	1.401	0.0827	---RW-95
6	2.42	5.83	1	N/A	N/A	N/A	1.454	13.051	1.382	0.0797	---RW-95
7	2.86	5.63	1	N/A	N/A	N/A	1.576	11.951	1.363	0.0760	---RW-95
8	3.30	5.42	1	N/A	N/A	N/A	1.721	10.841	1.344	0.0714	---RW-95
9	3.74	5.21	1	N/A	N/A	N/A	1.894	9.723	1.323	0.0659	---RW-95
10	4.18	5.01	1	N/A	N/A	N/A	2.104	8.597	1.302	0.0591	---RW-95
11	4.62	4.95	1	N/A	N/A	N/A	2.366	7.883	1.332	0.0445	---RW-95
12	5.06	4.95	1	N/A	N/A	N/A	2.700	7.325	1.386	0.0265	---RW-95
13	5.50	4.95	1	N/A	N/A	N/A	3.140	6.779	1.441	0.0072	---RW-95
14	5.94	4.95	1	N/A	N/A	N/A	3.744	6.234	1.497	-0.0148	---RW-95
15	6.38	4.95	1	N/A	N/A	N/A	4.625	5.703	1.552	-0.0430	---RW-95
16	6.82	4.95	1	N/A	N/A	N/A	5.694	4.922	1.604	-0.0871	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, CDR = 4.09, Meyerhof stress = 203.62 kPa.

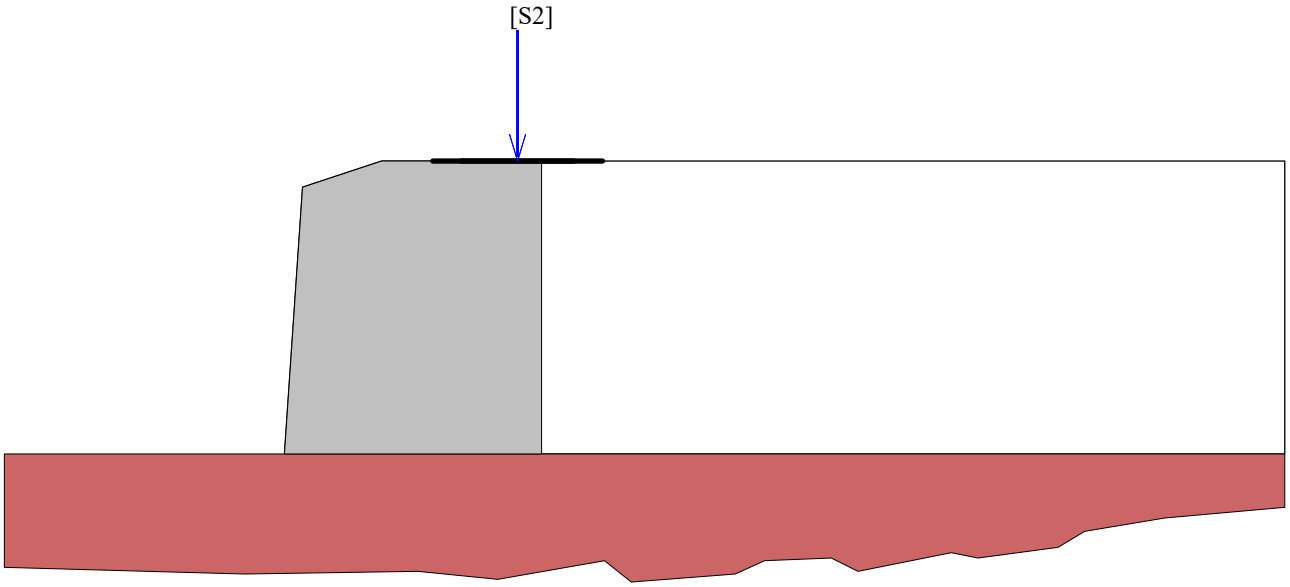
Foundation Interface: Direct sliding, CDR = 1.513, Eccentricity, e/L = 0.1290, Fs-overturning = 3.19

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.82	2	N/A	N/A	N/A	1.439	16.241	1.435	0.1222	---RW-125
2	0.66	6.63	2	N/A	N/A	N/A	1.530	15.621	1.405	0.1220	---RW-125
3	1.10	6.43	2	N/A	N/A	N/A	1.602	14.480	1.375	0.1212	---RW-125
4	1.54	6.24	1	N/A	N/A	N/A	1.220	13.308	1.345	0.1196	---RW-95
5	1.98	6.03	1	N/A	N/A	N/A	1.308	12.364	1.316	0.1174	---RW-95
6	2.42	5.83	1	N/A	N/A	N/A	1.410	11.419	1.286	0.1143	---RW-95
7	2.86	5.63	1	N/A	N/A	N/A	1.530	10.465	1.256	0.1102	---RW-95
8	3.30	5.42	1	N/A	N/A	N/A	1.671	9.501	1.227	0.1048	---RW-95
9	3.74	5.21	1	N/A	N/A	N/A	1.840	8.531	1.197	0.0981	---RW-95
10	4.18	5.01	1	N/A	N/A	N/A	2.045	7.554	1.167	0.0898	---RW-95
11	4.62	4.95	1	N/A	N/A	N/A	2.298	6.916	1.185	0.0703	---RW-95
12	5.06	4.95	1	N/A	N/A	N/A	2.618	6.405	1.224	0.0463	---RW-95
13	5.50	4.95	1	N/A	N/A	N/A	3.039	5.901	1.264	0.0207	---RW-95
14	5.94	4.95	1	N/A	N/A	N/A	3.614	5.395	1.306	-0.0079	---RW-95
15	6.38	4.95	1	N/A	N/A	N/A	4.446	4.894	1.351	-0.0434	---RW-95
16	6.82	4.95	1	N/A	N/A	N/A	5.454	4.190	1.404	-0.0955	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	703.9	832.7	[kPa]
Meyerhof stress, σ_V	276.92	203.6	[kPa]
Eccentricity, e	0.33	0.43	[m]
Eccentricity, e/L	0.048	0.063	
CDR calculated	2.54	4.09	
Base length	6.82	6.82	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 1.620 and CDR-seismic = 1.513

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.82	1.471	1.435	2	---RW-125
2	0.66	6.63	1.454	1.405	2	---RW-125
3	1.10	6.43	1.436	1.375	2	---RW-125
4	1.54	6.24	1.419	1.345	1	---RW-95
5	1.98	6.03	1.401	1.316	1	---RW-95
6	2.42	5.83	1.382	1.286	1	---RW-95
7	2.86	5.63	1.363	1.256	1	---RW-95
8	3.30	5.42	1.344	1.227	1	---RW-95
9	3.74	5.21	1.323	1.197	1	---RW-95
10	4.18	5.01	1.302	1.167	1	---RW-95
11	4.62	4.95	1.332	1.185	1	---RW-95
12	5.06	4.95	1.386	1.224	1	---RW-95
13	5.50	4.95	1.441	1.264	1	---RW-95
14	5.94	4.95	1.497	1.306	1	---RW-95
15	6.38	4.95	1.552	1.351	1	---RW-95
16	6.82	4.95	1.604	1.404	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0947, e/L seismic = 0.1290; Overturning: CDR-static = 4.09, CDR-seismic = 3.19

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.82	0.0893	0.1222	2	---RW-125
2	0.66	6.63	0.0883	0.1220	2	---RW-125
3	1.10	6.43	0.0869	0.1212	2	---RW-125
4	1.54	6.24	0.0851	0.1196	1	---RW-95
5	1.98	6.03	0.0827	0.1174	1	---RW-95
6	2.42	5.83	0.0797	0.1143	1	---RW-95
7	2.86	5.63	0.0760	0.1102	1	---RW-95
8	3.30	5.42	0.0714	0.1048	1	---RW-95
9	3.74	5.21	0.0659	0.0981	1	---RW-95
10	4.18	5.01	0.0591	0.0898	1	---RW-95
11	4.62	4.95	0.0445	0.0703	1	---RW-95
12	5.06	4.95	0.0265	0.0463	1	---RW-95
13	5.50	4.95	0.0072	0.0207	1	---RW-95
14	5.94	4.95	-0.0148	-0.0079	1	---RW-95
15	6.38	4.95	-0.0430	-0.0434	1	---RW-95
16	6.82	4.95	-0.0871	-0.0955	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	41.7	28.05	2.05	N/A	1.487	N/A	1.439	---RW-125
2	0.66	41.7	26.38	1.93	N/A	1.581	N/A	1.530	---RW-125
3	1.10	41.7	25.21	1.81	N/A	1.654	N/A	1.602	---RW-125
4	1.54	30.3	24.07	1.68	N/A	1.258	N/A	1.220	---RW-95
5	1.98	30.3	22.44	1.56	N/A	1.349	N/A	1.308	---RW-95
6	2.42	30.3	20.82	1.43	N/A	1.454	N/A	1.410	---RW-95
7	2.86	30.3	19.20	1.30	N/A	1.576	N/A	1.530	---RW-95
8	3.30	30.3	17.59	1.18	N/A	1.721	N/A	1.671	---RW-95
9	3.74	30.3	15.98	1.05	N/A	1.894	N/A	1.840	---RW-95
10	4.18	30.3	14.38	0.92	N/A	2.104	N/A	2.045	---RW-95
11	4.62	30.3	12.79	0.84	N/A	2.366	N/A	2.298	---RW-95
12	5.06	30.3	11.21	0.78	N/A	2.700	N/A	2.618	---RW-95
13	5.50	30.3	9.64	0.71	N/A	3.140	N/A	3.039	---RW-95
14	5.94	30.3	8.08	0.65	N/A	3.744	N/A	3.614	---RW-95
15	6.38	30.3	6.55	0.59	N/A	4.625	N/A	4.446	---RW-95
16	6.82	30.3	5.32	0.52	N/A	5.694	N/A	5.454	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	28.05	2.05	6.71	0.10	522.9	N/A	18.639	488.9	N/A	16.241
2	0.66	1.000	26.38	1.93	6.31	0.31	473.0	N/A	17.926	442.3	N/A	15.621
3	1.10	1.000	25.21	1.81	5.91	0.52	418.4	N/A	16.595	391.3	N/A	14.480
4	1.54	1.000	24.07	1.68	5.50	0.73	366.4	N/A	15.226	342.6	N/A	13.308
5	1.98	1.000	22.44	1.56	5.09	0.94	317.3	N/A	14.140	296.7	N/A	12.364
6	2.42	1.000	20.82	1.43	4.68	1.15	271.7	N/A	13.051	254.1	N/A	11.419
7	2.86	1.000	19.20	1.30	4.27	1.36	229.5	N/A	11.951	214.6	N/A	10.465
8	3.30	1.000	17.59	1.18	3.85	1.57	190.7	N/A	10.841	178.3	N/A	9.501
9	3.74	1.000	15.98	1.05	3.44	1.78	155.4	N/A	9.723	145.3	N/A	8.531
10	4.18	1.000	14.38	0.92	3.02	1.98	123.7	N/A	8.597	115.6	N/A	7.554
11	4.62	1.000	12.79	0.84	2.76	2.19	100.8	N/A	7.883	94.3	N/A	6.916
12	5.06	1.000	11.21	0.78	2.55	2.40	82.1	N/A	7.325	76.8	N/A	6.405
13	5.50	1.000	9.64	0.71	2.34	2.61	65.4	N/A	6.779	61.1	N/A	5.901
14	5.94	1.000	8.08	0.65	2.13	2.82	50.4	N/A	6.234	47.1	N/A	5.395
15	6.38	1.000	6.55	0.59	1.92	3.03	37.3	N/A	5.703	34.9	N/A	4.894
16	6.82	1.000	5.32	0.52	1.71	3.24	26.2	N/A	4.922	24.5	N/A	4.190

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
VK1-km0+875（Combination B）

PROJECT IDENTIFICATION

Title: VK1-km0+875（Combination B）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

,
Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+875（Combination B）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: DESIGN
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DESIGN DATA

DESIGN OBJECTIVES

Minimum Capacity Demand Ratio in pullout, CDR-po	1.10
Minimum Capacity Demand Ratio in direct sliding, CDR-sliding	1.10
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.2500
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-static	1.30
Minimum Capacity Demand Ratio in compound and overall failure, CDR-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 1.00 m.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 4.95 m.
Prescribed minimum absolute total length of each layer is: L = 3.00 m.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L	0.2500
Min. Capacity Demand Ratio with respect to ultimate bearing capacity (Meyerhof approach)	1.10

Bearing capacity coefficients: Nc = 22.25 N γ= 12.54

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3345 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3197 Kae (Kh = 0) = 0.3079 Δ Kae = 0.0117 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic CDR is 100.0% of specified static CDR for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

BEARING CAPACITY

Seismic CDR is 100.0% of specified static CDR for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.4000

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic Capacity Demand Ratio in pullout, CDR-po, is 100.0% of its specified static value.
Seismic Capacity Demand Ratio, CDR-overall, is 100.0% of its specified static value.
The reduction of CDR pertains to geogrid strength and to connection strength for break mode of failure.

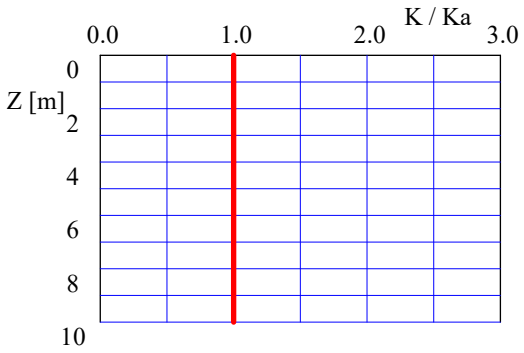
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids
(Multiple type reinforcement)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	1.00	1.00			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

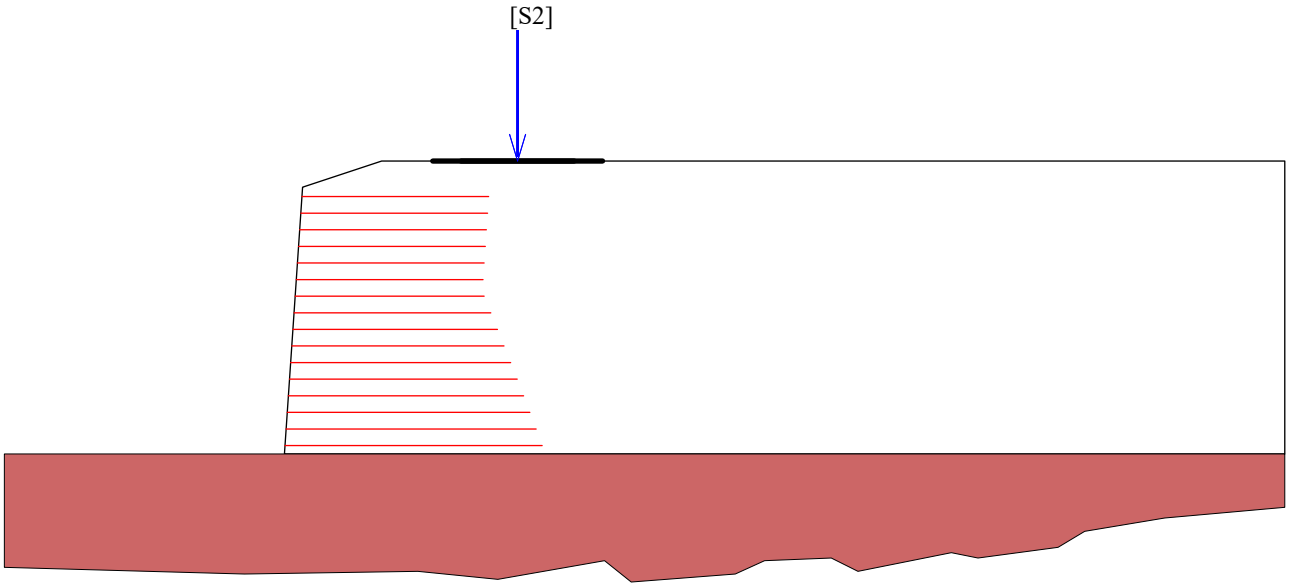
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	7.07	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 7.07 m }
Batter, ω	3.9	[deg]	
Backslope, β	18.2	[deg]	
Backslope rise	0.7	[m]	Broken back equivalent angle, I = 2.79° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 5.7 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 5.7 [m] @ depth of 0.0 [m] below soil surface.

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	0.90

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	0.77	0.90

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.50
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	0.83	0.90
Reinforced Soil and Reinforcement	ϕ_τ	0.77	0.90

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:	Static	Combined Static/Seismic
ϕ_b	0.74	0.90

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

REINFORCEMENT LAYOUT AND DESIGN CRITERIA

LEGEND: (1) Connection strength √ Satisfactory
(2) Geogrid strength ⊗ Unsatisfactory
(3) Pullout resistance
(4) Direct sliding
(5) Eccentricity

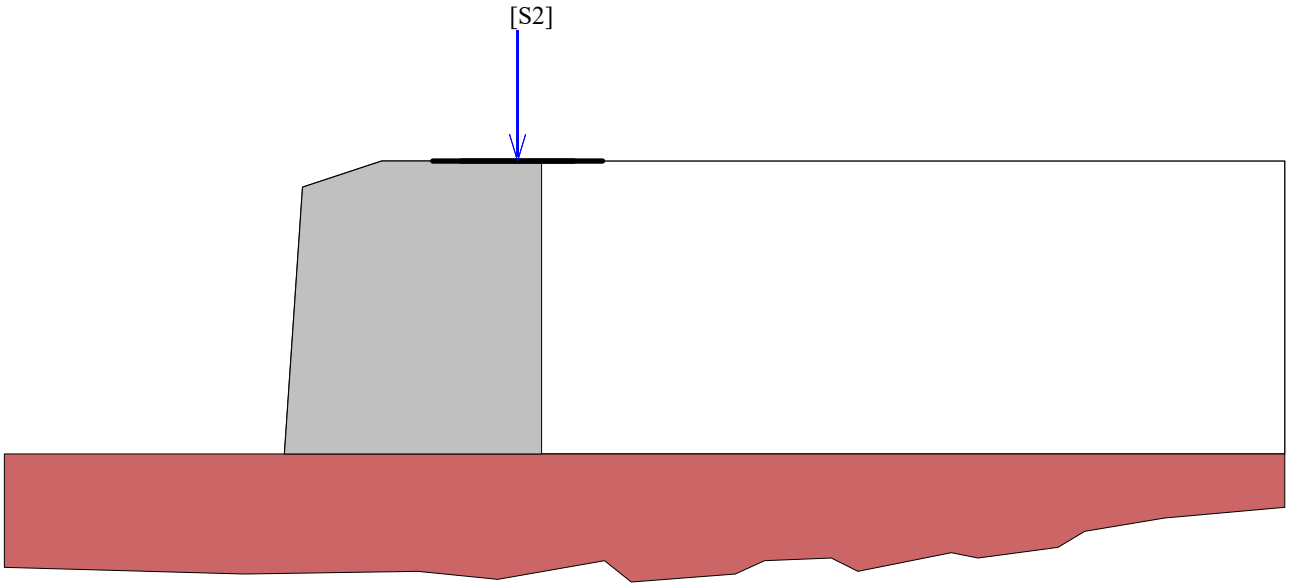
Bearing capacity: √
Foudation Interface: Direct sliding √ Eccentricity √

#	Geogrid Elevation [m]	Length [m]	Type #	(1)	(2)	(3)	(4)	(5)
1	0.22	6.82	2	N/A	√	√	√	√
2	0.66	6.63	2	N/A	√	√	√	√
3	1.10	6.43	2	N/A	√	√	√	√
4	1.54	6.24	1	N/A	√	√	√	√
5	1.98	6.03	1	N/A	√	√	√	√
6	2.42	5.83	1	N/A	√	√	√	√
7	2.86	5.63	1	N/A	√	√	√	√
8	3.30	5.42	1	N/A	√	√	√	√
9	3.74	5.21	1	N/A	√	√	√	√
10	4.18	5.01	1	N/A	√	√	√	√
11	4.62	4.95	1	N/A	√	√	√	√
12	5.06	4.95	1	N/A	√	√	√	√
13	5.50	4.95	1	N/A	√	√	√	√
14	5.94	4.95	1	N/A	√	√	√	√
15	6.38	4.95	1	N/A	√	√	√	√
16	6.82	4.95	1	N/A	√	√	√	√

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

BEARING CAPACITY for DESIGNED LAYOUT

	STATIC	SEISMIC	UNITS
(Water table does not affect bearing capacity)			
Ultimate bearing capacity, q-ult	665.1	845.4	[kPa]
Meyerhof stress, σ_V	198.70	187.5	[kPa]
Eccentricity, e	0.53	0.37	[m]
Eccentricity, e/L	0.078	0.055	
CDR calculated	3.35	4.51	
Base length	6.82	6.82	[m]



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

DIRECT SLIDING for DESIGNED LAYOUT
(for GEOGRID reinforcements)

Specified CDR-static = 1.100 and CDR-seismic = 1.100

Along reinforced and foundation soils interface: CDR-static = 1.246 and CDR-seismic = 1.746

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.82	1.101	1.659	2	---RW-125
2	0.66	6.63	1.101	1.644	2	---RW-125
3	1.10	6.43	1.101	1.628	2	---RW-125
4	1.54	6.24	1.101	1.612	1	---RW-95
5	1.98	6.03	1.101	1.596	1	---RW-95
6	2.42	5.83	1.101	1.580	1	---RW-95
7	2.86	5.63	1.101	1.563	1	---RW-95
8	3.30	5.42	1.101	1.546	1	---RW-95
9	3.74	5.21	1.101	1.528	1	---RW-95
10	4.18	5.01	1.101	1.510	1	---RW-95
11	4.62	4.95	1.147	1.554	1	---RW-95
12	5.06	4.95	1.217	1.628	1	---RW-95
13	5.50	4.95	1.295	1.708	1	---RW-95
14	5.94	4.95	1.383	1.794	1	---RW-95
15	6.38	4.95	1.484	1.889	1	---RW-95
16	6.82	4.95	1.609	2.003	1	---RW-95

ECCENTRICITY for DESIGNED LAYOUT

At interface with foundation: e/L static = 0.1235, e/L seismic = 0.0978; Overturning: CDR-static = 3.28, CDR-seismic = 3.93

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.82	0.1161	0.0919	2	---RW-125
2	0.66	6.63	0.1129	0.0903	2	---RW-125
3	1.10	6.43	0.1093	0.0882	2	---RW-125
4	1.54	6.24	0.1051	0.0856	1	---RW-95
5	1.98	6.03	0.1004	0.0825	1	---RW-95
6	2.42	5.83	0.0951	0.0787	1	---RW-95
7	2.86	5.63	0.0890	0.0743	1	---RW-95
8	3.30	5.42	0.0821	0.0688	1	---RW-95
9	3.74	5.21	0.0741	0.0623	1	---RW-95
10	4.18	5.01	0.0648	0.0546	1	---RW-95
11	4.62	4.95	0.0467	0.0387	1	---RW-95
12	5.06	4.95	0.0251	0.0192	1	---RW-95
13	5.50	4.95	0.0024	-0.0018	1	---RW-95
14	5.94	4.95	-0.0231	-0.0258	1	---RW-95
15	6.38	4.95	-0.0551	-0.0566	1	---RW-95
16	6.82	4.95	-0.1033	-0.1040	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	41.7	18.7	2.1	1.000	2.230	1.000	2.125	---RW-125
2	0.66	41.7	17.6	1.9	1.000	2.371	1.000	2.260	---RW-125
3	1.10	41.7	16.8	1.8	1.000	2.481	1.000	2.367	---RW-125
4	1.54	30.3	16.0	1.7	1.000	1.887	1.000	1.802	---RW-95
5	1.98	30.3	15.0	1.6	1.000	2.023	1.000	1.933	---RW-95
6	2.42	30.3	13.9	1.4	1.000	2.181	1.000	2.085	---RW-95
7	2.86	30.3	12.8	1.3	1.000	2.365	1.000	2.261	---RW-95
8	3.30	30.3	11.7	1.2	1.000	2.581	1.000	2.470	---RW-95
9	3.74	30.3	10.7	1.1	1.000	2.841	1.000	2.720	---RW-95
10	4.18	30.3	9.6	0.9	1.000	3.157	1.000	3.026	---RW-95
11	4.62	30.3	8.5	0.8	1.000	3.549	1.000	3.399	---RW-95
12	5.06	30.3	7.5	0.8	1.000	4.050	1.000	3.869	---RW-95
13	5.50	30.3	6.4	0.7	1.000	4.709	1.000	4.486	---RW-95
14	5.94	30.3	5.4	0.7	1.000	5.616	1.000	5.328	---RW-95
15	6.38	30.3	4.4	0.6	1.000	6.937	1.000	6.542	---RW-95
16	6.82	30.3	3.5	0.5	1.000	8.542	1.000	8.012	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	18.70	2.05	6.71	0.10	522.9	1.100	27.958	488.9	1.100	23.560
2	0.66	1.000	17.59	1.93	6.31	0.31	473.0	1.100	26.890	442.3	1.100	22.659
3	1.10	1.000	16.81	1.81	5.91	0.52	418.4	1.100	24.892	391.3	1.100	21.018
4	1.54	1.000	16.04	1.68	5.50	0.73	366.4	1.100	22.839	342.6	1.100	19.331
5	1.98	1.000	14.96	1.56	5.09	0.94	317.3	1.100	21.210	296.7	1.100	17.964
6	2.42	1.000	13.88	1.43	4.68	1.15	271.7	1.100	19.576	254.1	1.100	16.594
7	2.86	1.000	12.80	1.30	4.27	1.36	229.5	1.100	17.927	214.6	1.100	15.213
8	3.30	1.000	11.73	1.18	3.85	1.57	190.7	1.100	16.261	178.3	1.100	13.818
9	3.74	1.000	10.66	1.05	3.44	1.78	155.4	1.100	14.585	145.3	1.100	12.414
10	4.18	1.000	9.59	0.92	3.02	1.98	123.7	1.100	12.896	115.6	1.100	10.999
11	4.62	1.000	8.53	0.84	2.76	2.19	100.8	1.100	11.824	94.3	1.100	10.063
12	5.06	1.000	7.47	0.78	2.55	2.40	82.1	1.100	10.988	76.8	1.100	9.306
13	5.50	1.000	6.43	0.71	2.34	2.61	65.4	1.100	10.168	61.1	1.100	8.557
14	5.94	1.000	5.39	0.65	2.13	2.82	50.4	1.100	9.351	47.1	1.100	7.803
15	6.38	1.000	4.36	0.59	1.92	3.03	37.3	1.100	8.555	34.9	1.100	7.052
16	6.82	1.000	3.54	0.52	1.71	3.24	26.2	1.100	7.383	24.5	1.100	6.016

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD)
VK1-km0+875（Combination C）

PROJECT IDENTIFICATION

Title: VK1-km0+875（Combination C）
Project Number:
Client:
Designer: 戴征杰（BOSTD）
Station Number:

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\Dell\Desktop\2021\KV1-km0+875（Combination C）.BEN
Original date and time of creating this file: Wed Mar 24 14:26:26 2021

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

SOIL DATA

REINFORCED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	33.0 °

RETAINED SOIL

Unit weight, γ	19.5 kN/m ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	20.3 kN/m ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	26.0 °
Equivalent cohesion, $c_{equiv.}$	7.5 kPa

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2948 (if batter is less than 10° Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized
Inclination of internal slip plane, ψ = 61.50° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3345 (if batter is less than 10° Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 22.25 N γ= 12.54

SEISMICITY

Maximum ground acceleration coefficient, A = 0.050
Design acceleration coefficient in Internal Stability: Kh = 0.070
Design acceleration coefficient in External Stability: Kh = 0.019
(Kh in External Stability is based on allowable displacement, d = 100 mm.)

Kae (Kh > 0) = 0.3197 Kae (Kh = 0) = 0.3079 Δ Kae = 0.0117 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

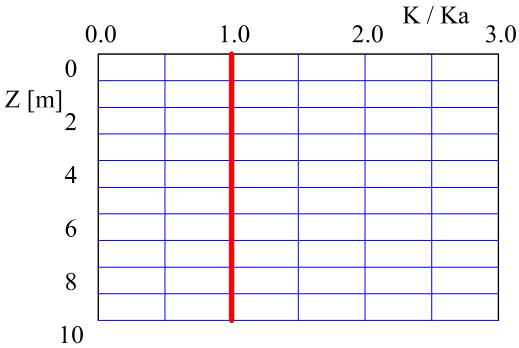
Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [kN/m]	95.7	127.3			
Durability reduction factor, RFd	1.10	1.10			
Installation-damage reduction factor, RFid	1.16	1.12			
Creep reduction factor, RFc	2.23	2.23	N/A	N/A	N/A
CDR for strength	N/A	N/A			
Coverage ratio, Rc	1.000	1.000			
Friction angle along geogrid-soil interface, ρ	26.57	26.57			
Pullout resistance factor, F*	0.67tanϕ	0.67tanϕ	N/A	N/A	N/A
Scale-effect correction factor, α	0.8	0.8			

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 m	1.00
1 m	1.00
2 m	1.00
3 m	1.00
4 m	1.00
5 m	1.00
6 m	1.00



Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

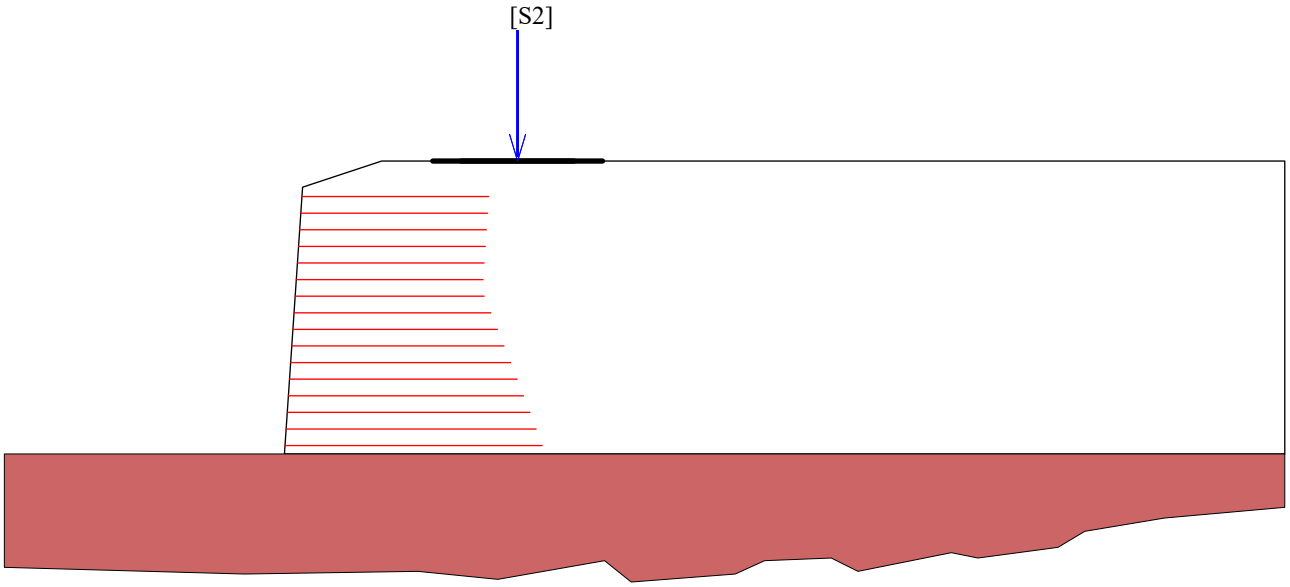
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	7.07	[m]	{ Embedded depth is E = 0.00 m, and height above top of finished bottom grade is H = 7.07 m }
Batter, ω	3.9	[deg]	
Backslope, β	18.2	[deg]	
Backslope rise	0.7	[m]	Broken back equivalent angle, I = 2.79° (see Fig. 25 in DEMO 82)

U N I F O R M S U R C H A R G E
Uniformly distributed dead load is 0.0 [kPa]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 12.5 and Qv-l = 0.0 [kPa].
Footing width, b=4.5 [m]. Distance of center of footing from wall face, d = 5.7 [m] @ depth of 0.0 [m] below soil surface.
[S2] Strip Load, Qv-d = 0.0 and Qv-l = 52.0 [kPa].
Footing width, b=3.0 [m]. Distance of center of footing from wall face, d = 5.7 [m] @ depth of 0.0 [m] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [m]

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

AASHTO 2007 (LRFD) Input Data

INTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2:	$\gamma_{p\text{-}EV}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1:	$\gamma_{p\text{-}EQ}$	1.00
Load factor for live load surchrge, LS, from Figure C11.5.5-3(b): (Same as in External Stability).	$\gamma_{p\text{-}LS}$	1.00
Load factor for dead load surchrge, ES: (Same as in External Stability).	$\gamma_{p\text{-}ES}$	1.00

Resistance factor for reinforcement tension from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00

Resistance factor for reinforcement tension in connectors from Table 11.5.6-1:	ϕ	Static	Combined static/seismic
Geogrid:		0.90	1.00

Resistance factor for reinforcement pullout from Table 11.5.6-1:	ϕ	1.00	1.00

EXTERNAL STABILITY

Load factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figure C11.5.5-2:		Static		Combined Static/Seismic
Sliding and Eccentricity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00
Bearing Capacity	$\gamma_{p\text{-}EV}$	1.00	$\gamma_{p\text{-}EQ}$	1.00

Load factor of active lateral earth pressure, EH, from Table 3.4.1-2 and Figure C11.5.5-2:	$\gamma_{p\text{-}EH}$	1.00
Load factor of active lateral earth pressure during earthquake (does not multiply P_{AE} and P_{IR}):	$(\gamma_{p\text{-}EH})_{EQ}$	1.00
Load factor for earthquake loads, EQ, from Table 3.4.1-1 (multiplies P_{AE} and P_{IR}):	$\gamma_{p\text{-}EQ}$	1.00

Resistance factor for shear resistance along common interfaces from Table 10.5.5.2.2-1:		Static	Combined Static/Seismic
Reinforced Soil and Foundation	ϕ_τ	1.00	1.00
Reinforced Soil and Reinforcement	ϕ_τ	1.00	1.00

Resistance factor for bearing capacity of shallow foundation from Table 10.5.5.2.2-1:	Static	Combined Static/Seismic
ϕ_b	1.00	1.00

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, CDR = 5.15, Meyerhof stress = 184.61 kPa.
Foundation Interface: Direct sliding, CDR = 2.036, Eccentricity, e/L = 0.0902, CDR-overturning = 4.16

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.82	2	N/A	N/A	N/A	2.230	36.309	1.934	0.0847	---RW-125
2	0.66	6.63	2	N/A	N/A	N/A	2.371	34.921	1.912	0.0836	---RW-125
3	1.10	6.43	2	N/A	N/A	N/A	2.481	32.327	1.890	0.0820	---RW-125
4	1.54	6.24	1	N/A	N/A	N/A	1.887	29.662	1.867	0.0799	---RW-95
5	1.98	6.03	1	N/A	N/A	N/A	2.023	27.545	1.844	0.0772	---RW-95
6	2.42	5.83	1	N/A	N/A	N/A	2.181	25.423	1.821	0.0740	---RW-95
7	2.86	5.63	1	N/A	N/A	N/A	2.365	23.282	1.797	0.0700	---RW-95
8	3.30	5.42	1	N/A	N/A	N/A	2.581	21.118	1.772	0.0652	---RW-95
9	3.74	5.21	1	N/A	N/A	N/A	2.841	18.942	1.746	0.0593	---RW-95
10	4.18	5.01	1	N/A	N/A	N/A	3.157	16.748	1.719	0.0522	---RW-95
11	4.62	4.95	1	N/A	N/A	N/A	3.549	15.356	1.762	0.0370	---RW-95
12	5.06	4.95	1	N/A	N/A	N/A	4.050	14.270	1.839	0.0181	---RW-95
13	5.50	4.95	1	N/A	N/A	N/A	4.709	13.205	1.922	-0.0024	---RW-95
14	5.94	4.95	1	N/A	N/A	N/A	5.616	12.144	2.010	-0.0261	---RW-95
15	6.38	4.95	1	N/A	N/A	N/A	6.937	11.110	2.108	-0.0567	---RW-95
16	6.82	4.95	1	N/A	N/A	N/A	8.542	9.588	2.227	-0.1040	---RW-95

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, CDR = 5.01, Meyerhof stress = 187.50 kPa.
Foundation Interface: Direct sliding, CDR = 1.940, Eccentricity, e/L = 0.0978, Fs-overturning = 3.93

GEOGRID				CONNECTION							
#	Elevation [m]	Length [m]	Type #	CDR [pullout resistance]	CDR [connection break]	CDR [geogrid strength]	Geogrid strength CDR	Pullout resistance CDR	Direct sliding CDR	Eccentricity e/L	Product name
1	0.22	6.82	2	N/A	N/A	N/A	2.361	26.178	1.843	0.0919	---RW-125
2	0.66	6.63	2	N/A	N/A	N/A	2.511	25.177	1.826	0.0903	---RW-125
3	1.10	6.43	2	N/A	N/A	N/A	2.630	23.353	1.809	0.0882	---RW-125
4	1.54	6.24	1	N/A	N/A	N/A	2.002	21.478	1.792	0.0856	---RW-95
5	1.98	6.03	1	N/A	N/A	N/A	2.148	19.960	1.774	0.0825	---RW-95
6	2.42	5.83	1	N/A	N/A	N/A	2.316	18.438	1.755	0.0787	---RW-95
7	2.86	5.63	1	N/A	N/A	N/A	2.513	16.903	1.736	0.0743	---RW-95
8	3.30	5.42	1	N/A	N/A	N/A	2.745	15.353	1.717	0.0688	---RW-95
9	3.74	5.21	1	N/A	N/A	N/A	3.023	13.793	1.698	0.0623	---RW-95
10	4.18	5.01	1	N/A	N/A	N/A	3.362	12.221	1.678	0.0546	---RW-95
11	4.62	4.95	1	N/A	N/A	N/A	3.776	11.181	1.727	0.0387	---RW-95
12	5.06	4.95	1	N/A	N/A	N/A	4.299	10.340	1.809	0.0192	---RW-95
13	5.50	4.95	1	N/A	N/A	N/A	4.984	9.508	1.898	-0.0018	---RW-95
14	5.94	4.95	1	N/A	N/A	N/A	5.920	8.670	1.993	-0.0258	---RW-95
15	6.38	4.95	1	N/A	N/A	N/A	7.269	7.835	2.099	-0.0566	---RW-95
16	6.82	4.95	1	N/A	N/A	N/A	8.902	6.685	2.225	-0.1040	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

Version 3.0 MSEW Version 3.0 MSEW Version 3.0 MSEW

DIRECT SLIDING for GIVEN LAYOUT (for GEOGRID reinforcements)

Along reinforced and foundation soils interface: CDR-static = 2.036 and CDR-seismic = 1.940

#	Geogrid Elevation [m]	Geogrid Length [m]	CDR Static	CDR Seismic	Geogrid Type #	Product name
1	0.22	6.82	1.934	1.843	2	---RW-125
2	0.66	6.63	1.912	1.826	2	---RW-125
3	1.10	6.43	1.890	1.809	2	---RW-125
4	1.54	6.24	1.867	1.792	1	---RW-95
5	1.98	6.03	1.844	1.774	1	---RW-95
6	2.42	5.83	1.821	1.755	1	---RW-95
7	2.86	5.63	1.797	1.736	1	---RW-95
8	3.30	5.42	1.772	1.717	1	---RW-95
9	3.74	5.21	1.746	1.698	1	---RW-95
10	4.18	5.01	1.719	1.678	1	---RW-95
11	4.62	4.95	1.762	1.727	1	---RW-95
12	5.06	4.95	1.839	1.809	1	---RW-95
13	5.50	4.95	1.922	1.898	1	---RW-95
14	5.94	4.95	2.010	1.993	1	---RW-95
15	6.38	4.95	2.108	2.099	1	---RW-95
16	6.82	4.95	2.227	2.225	1	---RW-95

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0902, e/L seismic = 0.0978; Overturning: CDR-static = 4.16, CDR-seismic = 3.93

#	Geogrid Elevation [m]	Geogrid Length [m]	e / L Static	e / L Seismic	Geogrid Type #	Product name
1	0.22	6.82	0.0847	0.0919	2	---RW-125
2	0.66	6.63	0.0836	0.0903	2	---RW-125
3	1.10	6.43	0.0820	0.0882	2	---RW-125
4	1.54	6.24	0.0799	0.0856	1	---RW-95
5	1.98	6.03	0.0772	0.0825	1	---RW-95
6	2.42	5.83	0.0740	0.0787	1	---RW-95
7	2.86	5.63	0.0700	0.0743	1	---RW-95
8	3.30	5.42	0.0652	0.0688	1	---RW-95
9	3.74	5.21	0.0593	0.0623	1	---RW-95
10	4.18	5.01	0.0522	0.0546	1	---RW-95
11	4.62	4.95	0.0370	0.0387	1	---RW-95
12	5.06	4.95	0.0181	0.0192	1	---RW-95
13	5.50	4.95	-0.0024	-0.0018	1	---RW-95
14	5.94	4.95	-0.0261	-0.0258	1	---RW-95
15	6.38	4.95	-0.0567	-0.0566	1	---RW-95
16	6.82	4.95	-0.1040	-0.1040	1	---RW-95

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

RESULTS for STRENGTH

#	Geogrid Elevation [m]	Tavailable [kN/m]	Tmax [kN/m]	Tmd [kN/m]	Specified minimum CDR static	Actual calculated CDR static	Specified minimum CDR seismic	Actual calculated CDR seismic	Product name
1	0.22	41.7	18.70	2.05	N/A	2.230	N/A	2.361	---RW-125
2	0.66	41.7	17.59	1.93	N/A	2.371	N/A	2.511	---RW-125
3	1.10	41.7	16.81	1.81	N/A	2.481	N/A	2.630	---RW-125
4	1.54	30.3	16.04	1.68	N/A	1.887	N/A	2.002	---RW-95
5	1.98	30.3	14.96	1.56	N/A	2.023	N/A	2.148	---RW-95
6	2.42	30.3	13.88	1.43	N/A	2.181	N/A	2.316	---RW-95
7	2.86	30.3	12.80	1.30	N/A	2.365	N/A	2.513	---RW-95
8	3.30	30.3	11.73	1.18	N/A	2.581	N/A	2.745	---RW-95
9	3.74	30.3	10.66	1.05	N/A	2.841	N/A	3.023	---RW-95
10	4.18	30.3	9.59	0.92	N/A	3.157	N/A	3.362	---RW-95
11	4.62	30.3	8.53	0.84	N/A	3.549	N/A	3.776	---RW-95
12	5.06	30.3	7.47	0.78	N/A	4.050	N/A	4.299	---RW-95
13	5.50	30.3	6.43	0.71	N/A	4.709	N/A	4.984	---RW-95
14	5.94	30.3	5.39	0.65	N/A	5.616	N/A	5.920	---RW-95
15	6.38	30.3	4.36	0.59	N/A	6.937	N/A	7.269	---RW-95
16	6.82	30.3	3.54	0.52	N/A	8.542	N/A	8.902	---RW-95

RESULTS for PULLOUT

#	Geogrid Elevation [m]	Coverage Ratio	Tmax [kN/m]	Tmd [kN/m]	Le [m]	La [m]	Avail.Static Pullout, Pr [kN/m]	Specified Static CDR	Actual Static CDR	Avail.Seism. Pullout, Pr [kN/m]	Specified Seismic CDR	Actual Seismic CDR
1	0.22	1.000	18.70	2.05	6.71	0.10	679.1	N/A	36.309	543.2	N/A	26.178
2	0.66	1.000	17.59	1.93	6.31	0.31	614.2	N/A	34.921	491.4	N/A	25.177
3	1.10	1.000	16.81	1.81	5.91	0.52	543.4	N/A	32.327	434.7	N/A	23.353
4	1.54	1.000	16.04	1.68	5.50	0.73	475.9	N/A	29.662	380.7	N/A	21.478
5	1.98	1.000	14.96	1.56	5.09	0.94	412.1	N/A	27.545	329.7	N/A	19.960
6	2.42	1.000	13.88	1.43	4.68	1.15	352.9	N/A	25.423	282.3	N/A	18.438
7	2.86	1.000	12.80	1.30	4.27	1.36	298.0	N/A	23.282	238.4	N/A	16.903
8	3.30	1.000	11.73	1.18	3.85	1.57	247.6	N/A	21.118	198.1	N/A	15.353
9	3.74	1.000	10.66	1.05	3.44	1.78	201.8	N/A	18.942	161.5	N/A	13.793
10	4.18	1.000	9.59	0.92	3.02	1.98	160.6	N/A	16.748	128.5	N/A	12.221
11	4.62	1.000	8.53	0.84	2.76	2.19	131.0	N/A	15.356	104.8	N/A	11.181
12	5.06	1.000	7.47	0.78	2.55	2.40	106.7	N/A	14.270	85.3	N/A	10.340
13	5.50	1.000	6.43	0.71	2.34	2.61	84.9	N/A	13.205	67.9	N/A	9.508
14	5.94	1.000	5.39	0.65	2.13	2.82	65.5	N/A	12.144	52.4	N/A	8.670
15	6.38	1.000	4.36	0.59	1.92	3.03	48.5	N/A	11.110	38.8	N/A	7.835
16	6.82	1.000	3.54	0.52	1.71	3.24	34.0	N/A	9.588	27.2	N/A	6.685

Copyright ?1998-2007 ADAMA Engineering, Inc. License number MWRG-301431

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

0+875 overall stability（no seismicity）

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title: 0+875 overall stability（no seismicity）
Project Number: -
Client:
Designer: 戴征杰（BOSTD）

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia

Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\D ..... 75 overall stability analysis（no seismicity）.MSE
Original date and time of creating this file: Thu Mar 25 16:40:38 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m³]	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
1....... Reinforced Soil.................................	19.5	33.0	0.0
2....... Retained Soil.....................................	19.5	30.0	0.0
3....... Foundation Soil.................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00
2	---RW-125	127.30	1.12	1.10	2.23	1.00	1.00

Interaction Parameters		== Direct Sliding ==		==== Pullout ====	
Type #	Geosynthetic Designated Name	Cds-phi	Cds-c	Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80
2	---RW-125	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

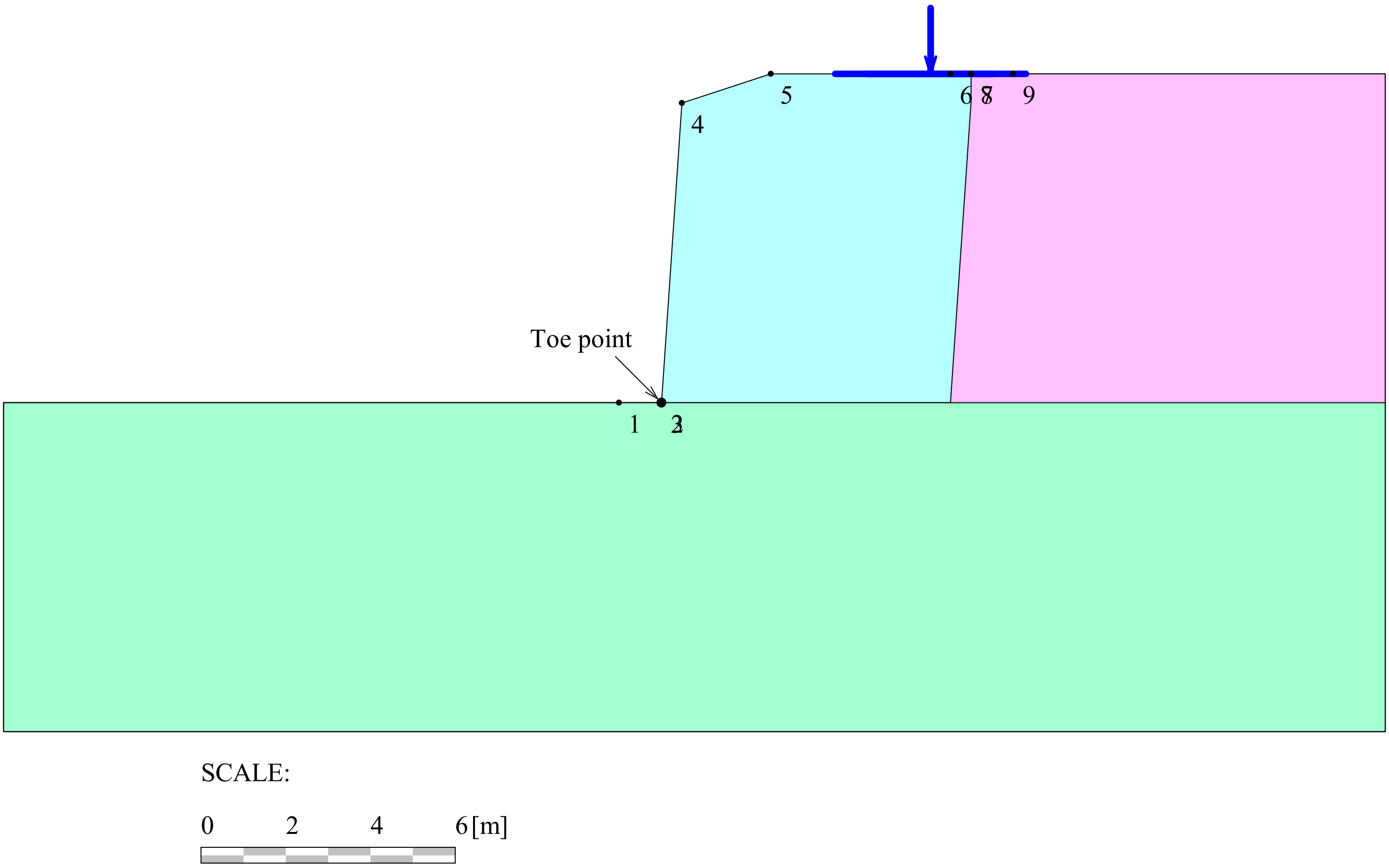
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1....................................None
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

Strip Load #1.. 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 6.35 [m]
Strip Load #2.. 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 6.35 [m]



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.48	7.07
	5	2.58	7.76
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	6.82	0.00
	10	7.30	7.07
	11	7.30	7.76
	12	8.30	7.76
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc.　　www.GeoPrograms.com　　License number ReWRG-301204

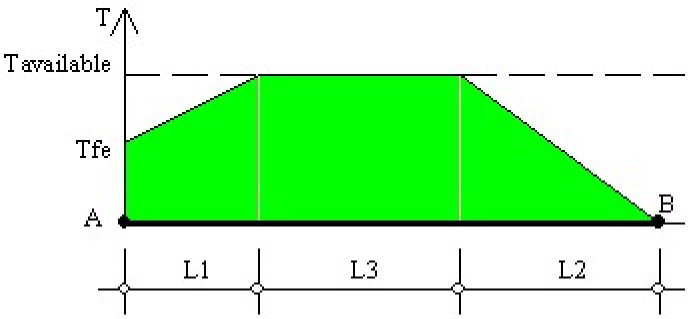
TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.48	7.07	0.00	0.00
5	2.58	7.76	0.00	0.00
6	6.82	7.76	0.00	0.00
7	7.30	7.76	7.07	0.00
8	7.30	7.76	7.76	0.00
9	8.30	7.76	7.76	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---RW-125	0.22	6.82	0.00	0.68	6.14	46.34	46.34
2	---RW-125	0.66	6.63	0.00	0.73	5.90	46.34	46.34
3	---RW-125	1.10	6.43	0.00	0.77	5.66	46.34	46.34
4	---RW-95	1.54	6.24	0.00	0.60	5.64	33.63	33.63
5	---RW-95	1.98	6.03	0.00	0.65	5.38	33.63	33.63
6	---RW-95	2.42	5.83	0.00	0.70	5.13	33.63	33.63
7	---RW-95	2.86	5.63	0.00	0.76	4.87	33.63	33.63
8	---RW-95	3.30	5.42	0.00	0.84	4.58	33.63	33.63
9	---RW-95	3.74	5.21	0.00	0.93	4.28	33.63	33.63
10	---RW-95	4.18	5.01	0.00	1.04	3.97	33.63	33.63
11	---RW-95	4.62	4.95	0.00	1.19	3.76	33.63	33.63
12	---RW-95	5.06	4.95	0.00	1.38	3.57	33.63	33.63
13	---RW-95	5.50	4.95	0.00	1.65	3.30	33.63	33.63
14	---RW-95	5.94	4.95	0.00	2.05	2.90	33.63	33.63
15	---RW-95	6.38	4.95	0.00	2.70	2.25	33.63	33.63
16	---RW-95	6.82	4.95	0.00	4.37	0.58	33.63	33.63

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	5.70	7.76	-7.74	0.02	-3.32	7.89	9.03	3.13	
2	6.63	7.76	-7.77	0.05	-2.65	7.78	9.28	2.05	
3	7.56	7.76	-7.75	0.04	-2.05	7.78	9.61	1.73	
4	8.49	7.76	-6.24	0.06	-0.91	7.79	9.40	1.61	
5	9.42	7.76	-6.33	0.13	-0.31	7.77	9.73	1.55	
6	10.35	7.76	-7.09	0.13	-0.34	8.44	10.71	1.54	
. 7	11.28	7.76	-7.02	0.06	-0.24	9.55	11.66	1.53 .	OK
8	12.21	7.76	-7.76	0.04	-0.64	11.30	13.33	1.55	
9	13.14	7.76	-7.90	0.11	-0.60	12.80	14.64	1.58	
10	14.07	7.76	-7.81	0.06	-0.61	14.53	16.17	1.63	
11	15.00	7.76	-7.73	0.01	-0.68	16.54	17.97	1.69	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

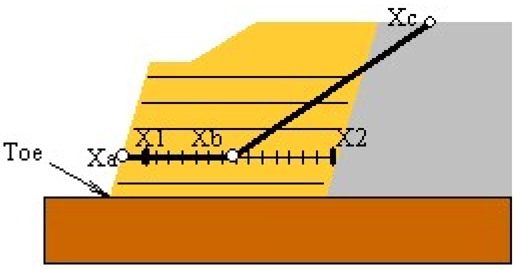
Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-7.83	0.10	11.28	7.76	-0.61	9.76	12.06	1.53	
. 2	-7.02	0.06	11.28	7.76	-0.24	9.55	11.66	1.53 .	OK
3	-6.19	0.02	11.28	7.76	0.13	9.33	11.26	1.53	
4	-5.53	0.09	11.28	7.76	0.52	9.10	10.85	1.55	
5	-4.72	0.07	10.35	7.76	0.84	7.79	9.51	1.58	
6	-3.96	0.06	11.28	7.76	1.30	8.58	10.01	1.62	
7	-3.09	0.00	10.35	7.76	1.31	7.91	9.05	1.68	
8	-2.47	0.08	10.35	7.76	1.55	7.91	8.80	1.76	
9	-1.65	0.05	10.35	7.76	1.80	7.87	8.55	1.87	
10	-0.88	0.02	8.49	7.76	0.60	7.77	7.89	1.99	
11	-0.00	0.00	9.42	7.76	0.16	9.40	9.40	2.04	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	8.52	7.76	1.40	Minimum on Edge
Reinf. Layer #1	0.22	0.02	0.22	0.10	0.22	8.47	7.76	1.47	Minimum on Edge
Reinf. Layer #2	0.66	0.05	0.66	0.10	0.66	7.99	7.76	1.50	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	0.20	1.10	7.86	7.76	1.52	Minimum on Edge
Reinf. Layer #4	1.54	0.11	1.54	0.20	1.54	7.88	7.76	1.56	Minimum on Edge
Reinf. Layer #5	1.98	0.14	1.98	1.38	1.98	8.27	7.76	1.63	OK
Reinf. Layer #6	2.42	0.17	2.42	1.44	2.42	8.27	7.76	1.69	OK
Reinf. Layer #7	2.86	0.20	2.86	4.69	2.86	8.66	7.76	1.69	OK
Reinf. Layer #8	3.30	0.23	3.30	4.53	3.30	8.41	7.76	1.67	OK
Reinf. Layer #9	3.74	0.26	3.74	4.47	3.74	8.09	7.76	1.66	OK
Reinf. Layer #10	4.18	0.29	4.18	4.31	4.18	7.89	7.76	1.67	OK
Reinf. Layer #11	4.62	0.32	4.62	5.19	4.62	7.82	7.76	1.65	Minimum on Edge
Reinf. Layer #12	5.06	0.35	5.06	5.19	5.06	7.80	7.76	1.67	Minimum on Edge
Reinf. Layer #13	5.50	0.38	5.50	5.29	5.50	7.63	7.76	1.74	Minimum on Edge
Reinf. Layer #14	5.94	0.41	5.94	5.29	5.94	6.99	7.76	1.79	Minimum on Edge
Reinf. Layer #15	6.38	0.44	6.38	5.29	6.38	6.58	7.76	1.87	Minimum on Edge
Reinf. Layer #16	6.82	0.47	6.82	4.43	6.82	5.59	7.76	1.92	OK

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.53

Critical Circle: Xc = -0.24[m], Yc = 9.55[m], R = 11.66[m]. (Number of slices used = 58)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

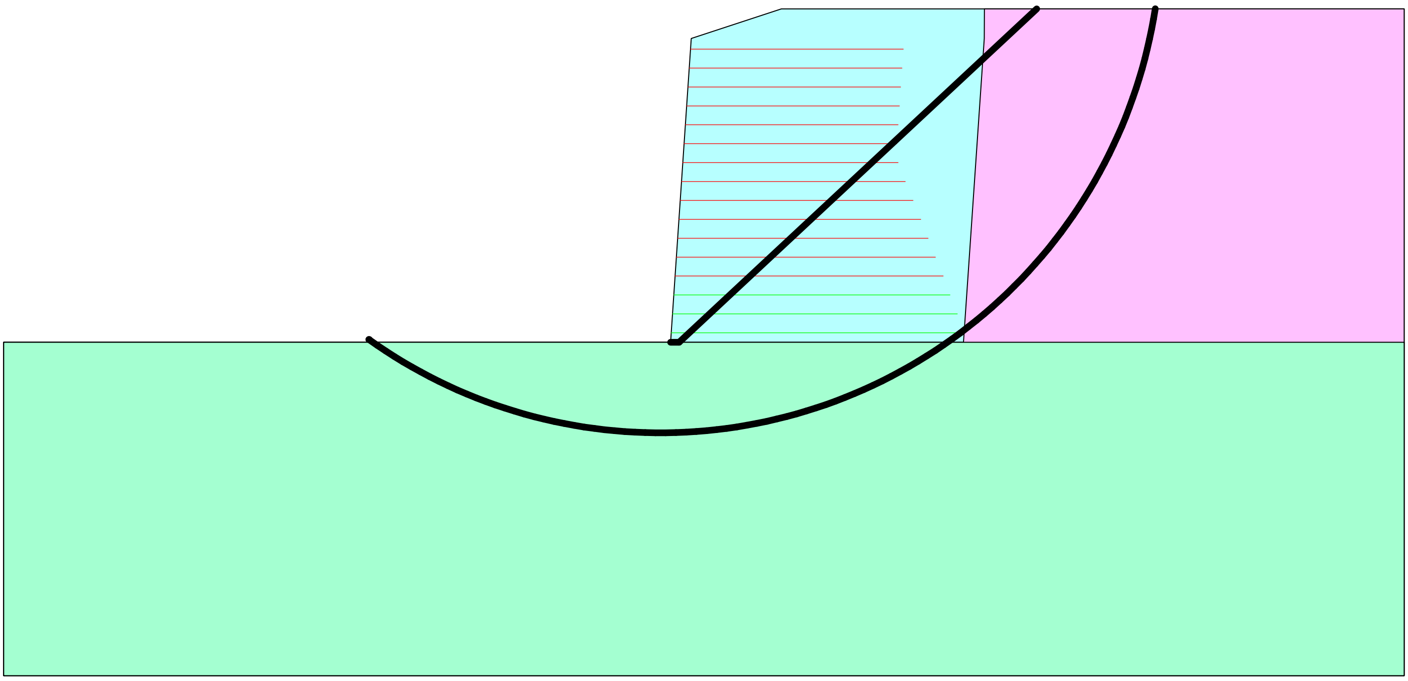
Minimum Factor of Safety = 1.40

Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [m]
(Xb = 0.20, Yb = 0.00) [m]
(Xc = 8.52, Yc = 7.76) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 42.96 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING

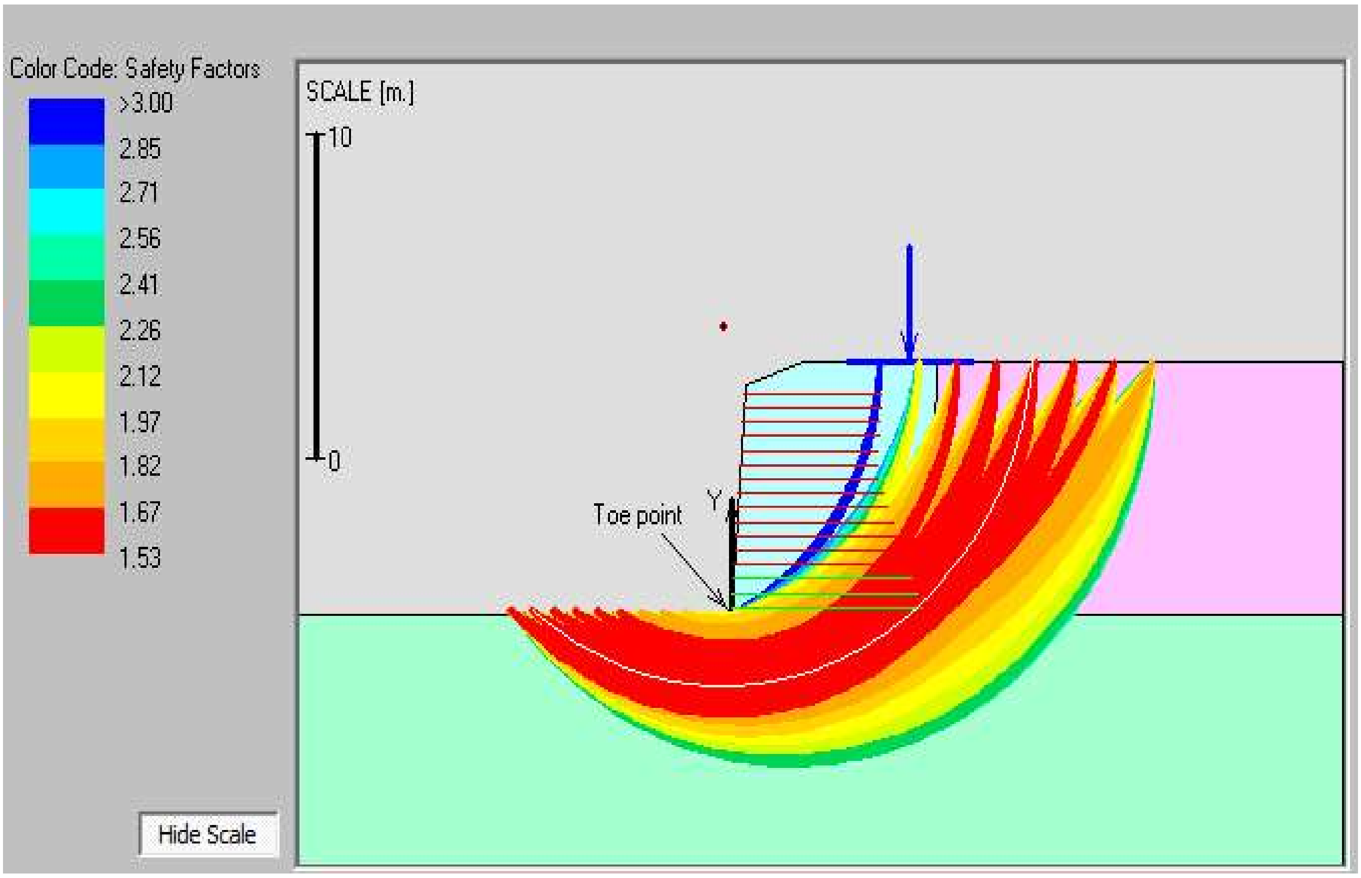


SCALE:

0 2 4 6[m]

Copyright ?2001-2016 ADAMA Engineering, Inc.　　www.GeoPrograms.com　　License number ReWRG-301204

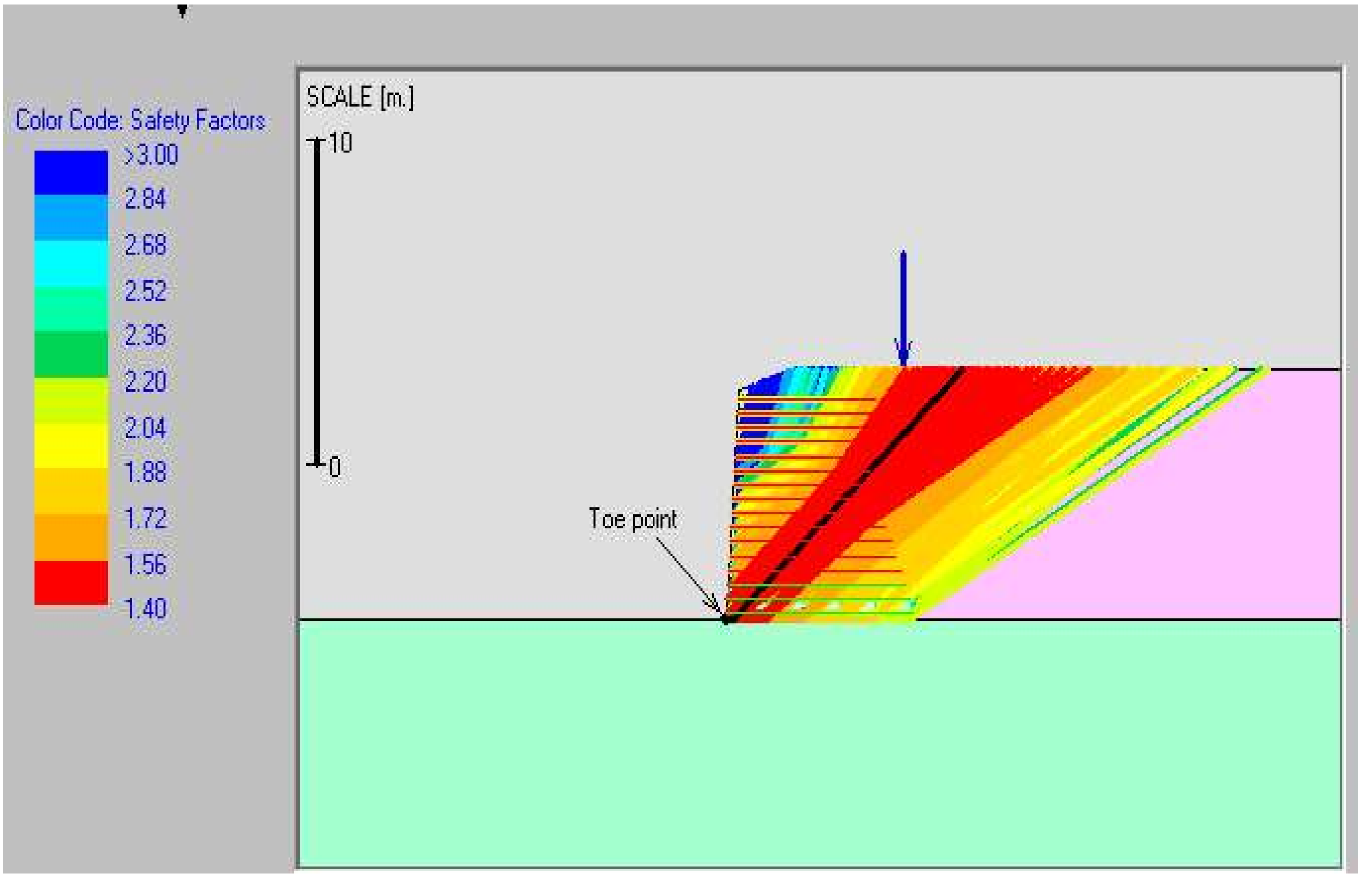
SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

0+875 overall stability (seismicity）

Report created by ReSSA(3.0): Update #4.21: Copyright (c) 2001-2016, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title: 0+875 overall stability (seismicity）
Project Number: -
Client:
Designer: 戴征杰（BOSTD）

Description:

Company's information:

Name: China Railway Design Corporation Serbia Ogranak Beogrda
Street: Koste Racina 16b, 11000 Belgrade, Serbia
,
Telephone #:
Fax #:
E-Mail:

Original file path and name: C:\Users\D ..... 75 overall stability analysis.MSE
Original date and time of creating this file: Thu Mar 25 16:40:38 2021

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

=========== Soil Layer #: ===========	Unit weight, γ [kN/m³]	Internal angle of friction, ϕ [deg.]	Cohesion, c [kPa]
1....... Reinforced Soil..................................	19.5	33.0	0.0
2....... Retained Soil......................................	19.5	30.0	0.0
3....... Foundation Soil..................................	20.3	26.0	7.5

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	---RW-95	95.70	1.16	1.10	2.23	1.00	1.00
2	---RW-125	127.30	1.12	1.10	2.23	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	---RW-95	0.77	0.00	0.67	0.80
2	---RW-125	0.77	0.00	0.67	0.80

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Horizontal peak ground acceleration coefficient, Ao = 0.140
Design horizontal seismic coefficient, kh = Am = 0.50 x Ao = 0.070 & design vertical seismic coefficient, kv (down) = 0.000 x kh = 0.000

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

DRAWING OF SPECIFIED GEOMETRY - GENERAL - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

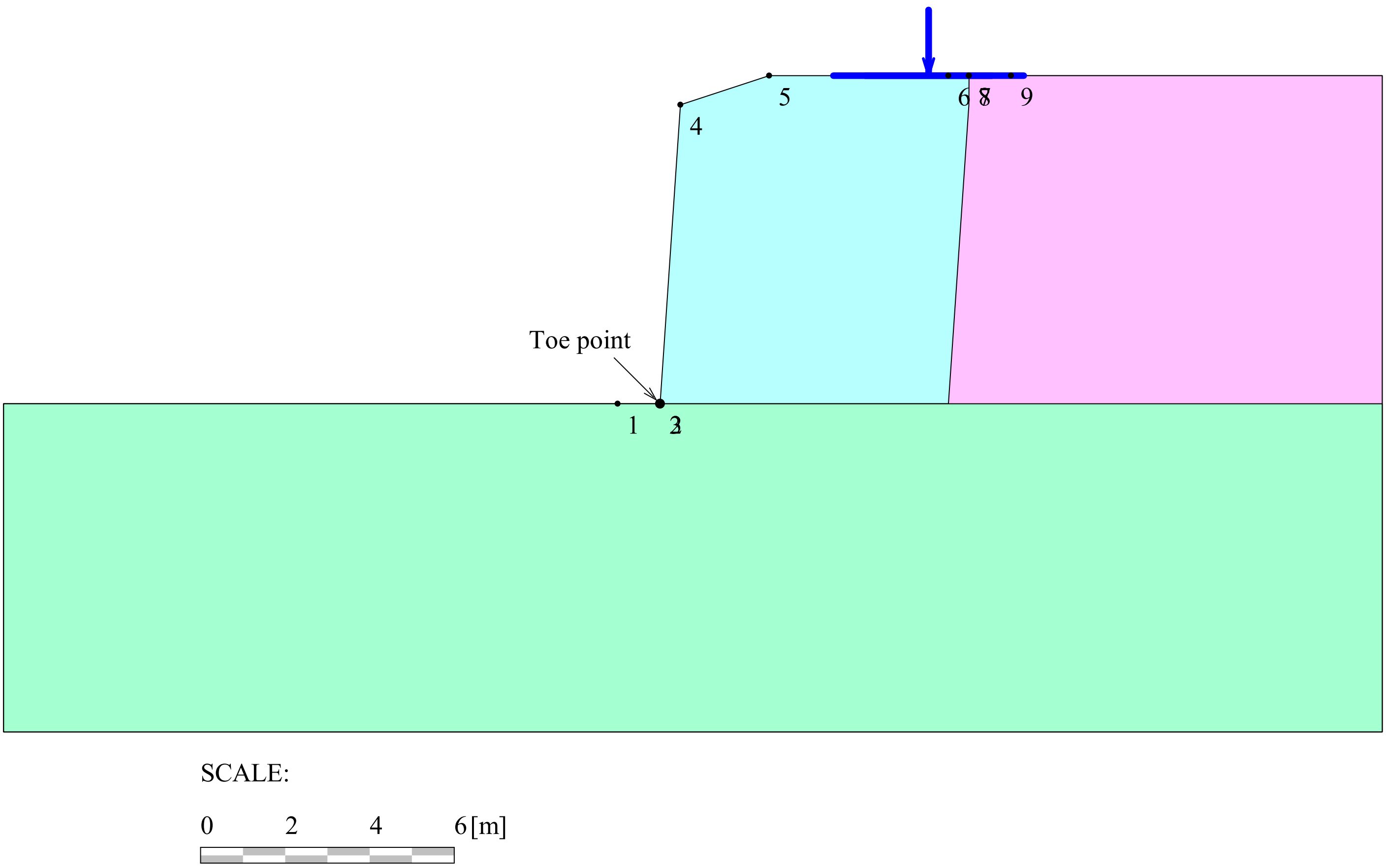
Soil profile contains 3 layers (see details in next page)

UNIFORM SURCHARGE

Surcharge load, Q1....................................None
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

Strip Load #1.. 12.50 [kPa] Width of base, b = 4.50 [m] Distance from toe point, d = 6.35 [m]
Strip Load #2.. 52.00 [kPa] Width of base, b = 3.00 [m] Distance from toe point, d = 6.35 [m]



Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

TABULATED DETAILS OF GEMERAL SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

	#	Xi	Yi
Top of Layer 1	1	-1.00	0.00
	2	-0.00	0.00
	3	0.00	0.00
	4	0.48	7.07
	5	2.58	7.76
Top of Layer 2	6	-1.00	0.00
	7	-0.00	0.00
	8	0.00	0.00
	9	6.82	0.00
	10	7.30	7.07
	11	7.30	7.76
	12	8.30	7.76
Top of Layer 3	13	-1.00	0.00
	14	-0.00	0.00
	15	0.00	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

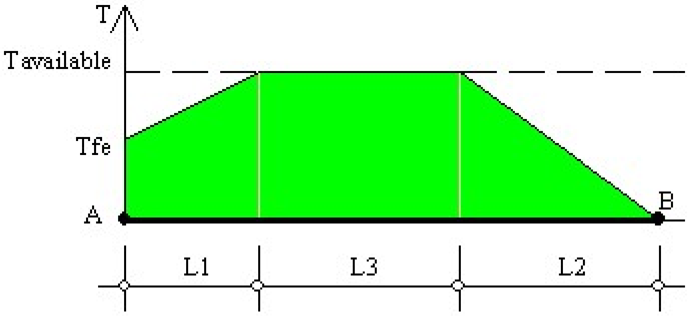
TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 3 layers. Coordinates in [m.]

#	X	Y1	Y2	Y3
1	-1.00	0.00	0.00	0.00
2	-0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.48	7.07	0.00	0.00
5	2.58	7.76	0.00	0.00
6	6.82	7.76	0.00	0.00
7	7.30	7.76	7.07	0.00
8	7.30	7.76	7.76	0.00
9	8.30	7.76	7.76	0.00

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	---RW-125	0.22	6.82	0.00	0.68	6.14	46.34	46.34
2	---RW-125	0.66	6.63	0.00	0.73	5.90	46.34	46.34
3	---RW-125	1.10	6.43	0.00	0.77	5.66	46.34	46.34
4	---RW-95	1.54	6.24	0.00	0.60	5.64	33.63	33.63
5	---RW-95	1.98	6.03	0.00	0.65	5.38	33.63	33.63
6	---RW-95	2.42	5.83	0.00	0.70	5.13	33.63	33.63
7	---RW-95	2.86	5.63	0.00	0.76	4.87	33.63	33.63
8	---RW-95	3.30	5.42	0.00	0.84	4.58	33.63	33.63
9	---RW-95	3.74	5.21	0.00	0.93	4.28	33.63	33.63
10	---RW-95	4.18	5.01	0.00	1.04	3.97	33.63	33.63
11	---RW-95	4.62	4.95	0.00	1.19	3.76	33.63	33.63
12	---RW-95	5.06	4.95	0.00	1.38	3.57	33.63	33.63
13	---RW-95	5.50	4.95	0.00	1.65	3.30	33.63	33.63
14	---RW-95	5.94	4.95	0.00	2.05	2.90	33.63	33.63
15	---RW-95	6.38	4.95	0.00	2.70	2.25	33.63	33.63
16	---RW-95	6.82	4.95	0.00	4.37	0.58	33.63	33.63

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

Version 3.0 ReSSA Version 3.0

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.)
The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	5.70	7.76	-10.00	0.08	-4.04	7.78	9.74	2.49	
2	6.63	7.76	-8.41	0.01	-2.92	7.82	9.55	1.86	
3	7.56	7.76	-6.98	0.05	-1.80	7.85	9.36	1.59	
4	8.49	7.76	-7.81	0.13	-1.50	7.87	9.99	1.47	
5	9.42	7.76	-6.31	0.13	-0.30	7.76	9.72	1.42	
6	10.35	7.76	-7.05	0.12	-0.32	8.42	10.69	1.40	
. 7	11.28	7.76	-7.77	0.09	-0.58	9.73	12.02	1.38 .	OK
8	12.21	7.76	-7.69	0.03	-0.61	11.27	13.29	1.38	
9	13.14	7.76	-7.83	0.10	-0.57	12.77	14.60	1.40	
10	14.07	7.76	-9.36	0.11	-1.36	15.30	17.17	1.43	
11	15.00	7.76	-8.42	0.01	-0.96	16.72	18.30	1.46	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.)
The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

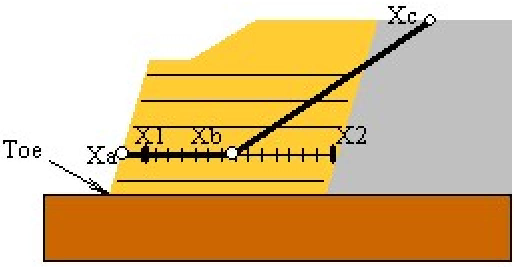
Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	-10.11	0.15	12.21	7.76	-1.73	12.11	14.61	1.41	
2	-9.32	0.11	12.21	7.76	-1.29	11.65	14.05	1.40	
3	-8.46	0.04	12.21	7.76	-0.95	11.47	13.67	1.38	
. 4	-7.77	0.09	11.28	7.76	-0.58	9.73	12.02	1.38 .	OK
5	-6.98	0.06	11.28	7.76	-0.22	9.53	11.64	1.38	
6	-6.18	0.02	11.28	7.76	0.14	9.33	11.25	1.39	
7	-5.55	0.10	11.28	7.76	0.51	9.10	10.85	1.40	
8	-4.71	0.04	11.28	7.76	0.89	8.86	10.45	1.43	
9	-4.03	0.08	11.28	7.76	1.27	8.61	10.04	1.46	
10	-3.32	0.10	11.28	7.76	1.67	8.34	9.63	1.52	
11	-2.56	0.08	12.21	7.76	1.98	9.39	10.36	1.58	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

Version 3.0 ReSSA Version 3.0

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [m]	(Xa, Ya) [m]		(Xb, Yb) [m]		(Xc, Yc) [m]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	8.52	7.76	1.31	Minimum on Edge
Reinf. Layer #1	0.22	0.02	0.22	0.10	0.22	8.77	7.76	1.37	Minimum on Edge
Reinf. Layer #2	0.66	0.05	0.66	0.10	0.66	9.19	7.76	1.40	Minimum on Edge
Reinf. Layer #3	1.10	0.08	1.10	0.20	1.10	8.42	7.76	1.42	Minimum on Edge
Reinf. Layer #4	1.54	0.11	1.54	1.42	1.54	8.83	7.76	1.44	OK
Reinf. Layer #5	1.98	0.14	1.98	1.38	1.98	8.78	7.76	1.49	OK
Reinf. Layer #6	2.42	0.17	2.42	4.85	2.42	9.66	7.76	1.49	OK
Reinf. Layer #7	2.86	0.20	2.86	4.69	2.86	8.95	7.76	1.48	OK
Reinf. Layer #8	3.30	0.23	3.30	4.53	3.30	8.41	7.76	1.47	OK
Reinf. Layer #9	3.74	0.26	3.74	4.47	3.74	8.09	7.76	1.46	OK
Reinf. Layer #10	4.18	0.29	4.18	5.29	4.18	8.09	7.76	1.48	Minimum on Edge
Reinf. Layer #11	4.62	0.32	4.62	5.19	4.62	7.82	7.76	1.45	Minimum on Edge
Reinf. Layer #12	5.06	0.35	5.06	5.19	5.06	7.80	7.76	1.48	Minimum on Edge
Reinf. Layer #13	5.50	0.38	5.50	5.29	5.50	7.47	7.76	1.54	Minimum on Edge
Reinf. Layer #14	5.94	0.41	5.94	5.29	5.94	6.99	7.76	1.60	Minimum on Edge
Reinf. Layer #15	6.38	0.44	6.38	5.29	6.38	6.53	7.76	1.67	Minimum on Edge
Reinf. Layer #16	6.82	0.47	6.82	4.43	6.82	5.55	7.76	1.71	OK

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.38

Critical Circle: Xc = -0.58[m], Yc = 9.73[m], R = 12.02[m]. (Number of slices used = 57)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

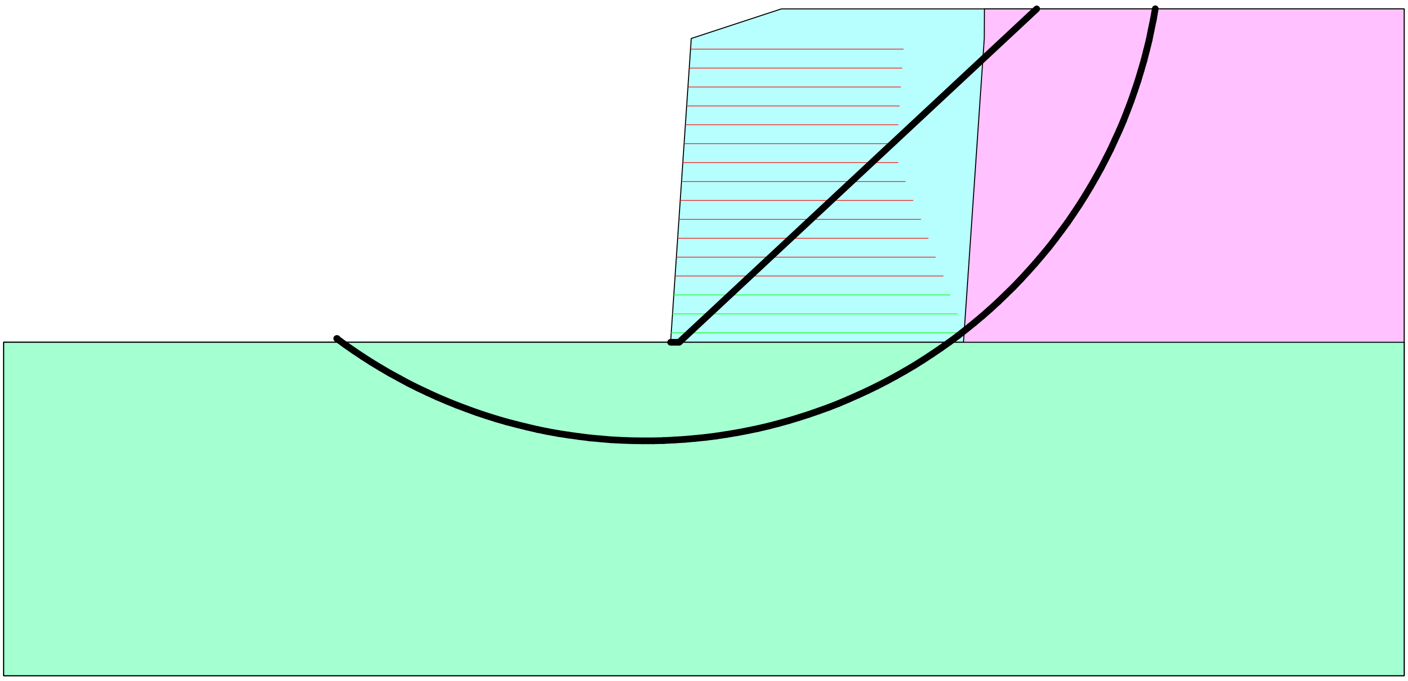
Minimum Factor of Safety = 1.31

Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [m]
(Xb = 0.20, Yb = 0.00) [m]
(Xc = 8.52, Yc = 7.76) [m]
(Number of slices used = 30)
Interslice resultant force inclination = 42.97 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING

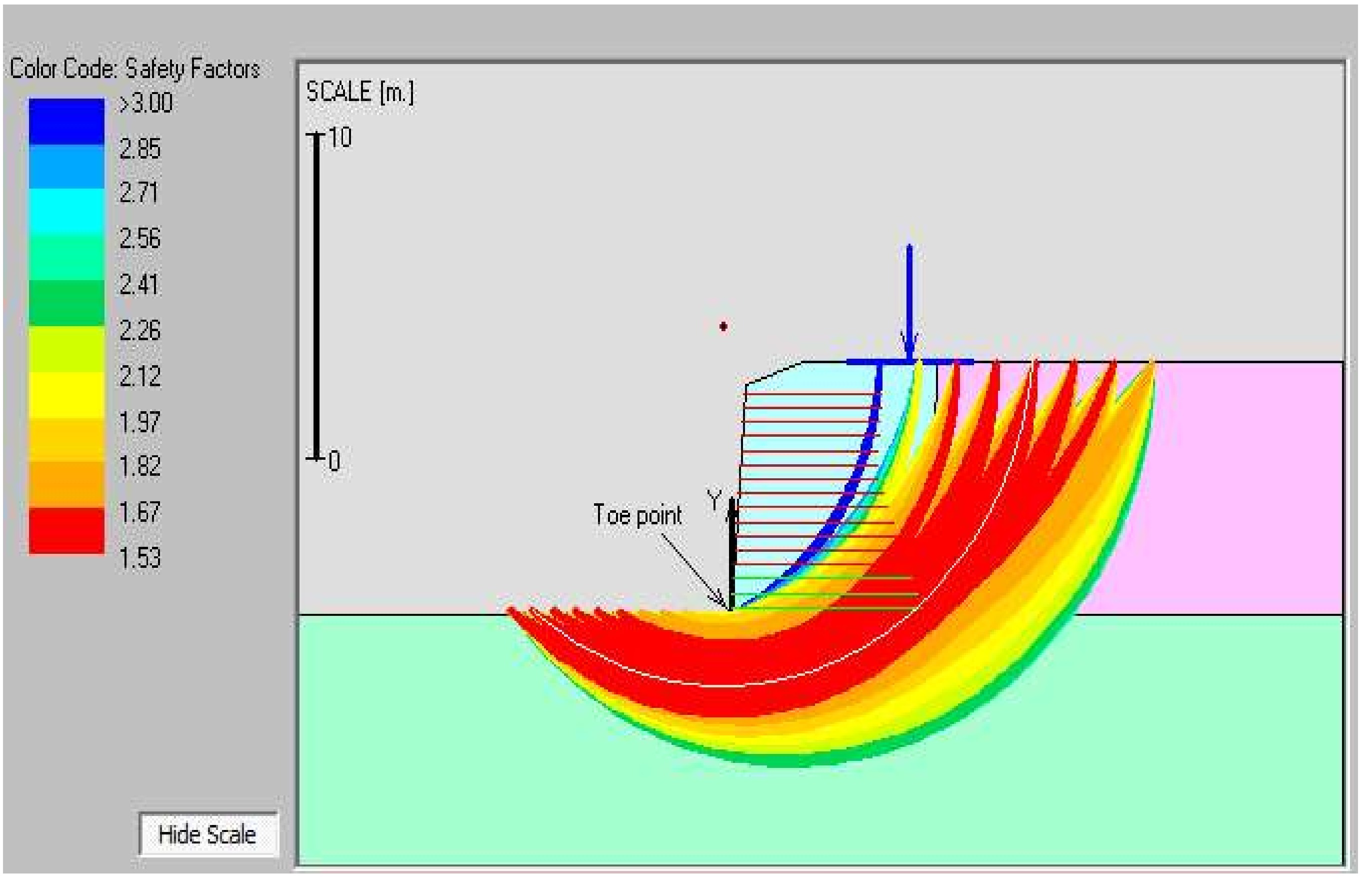


SCALE:

0 2 4 6[m]

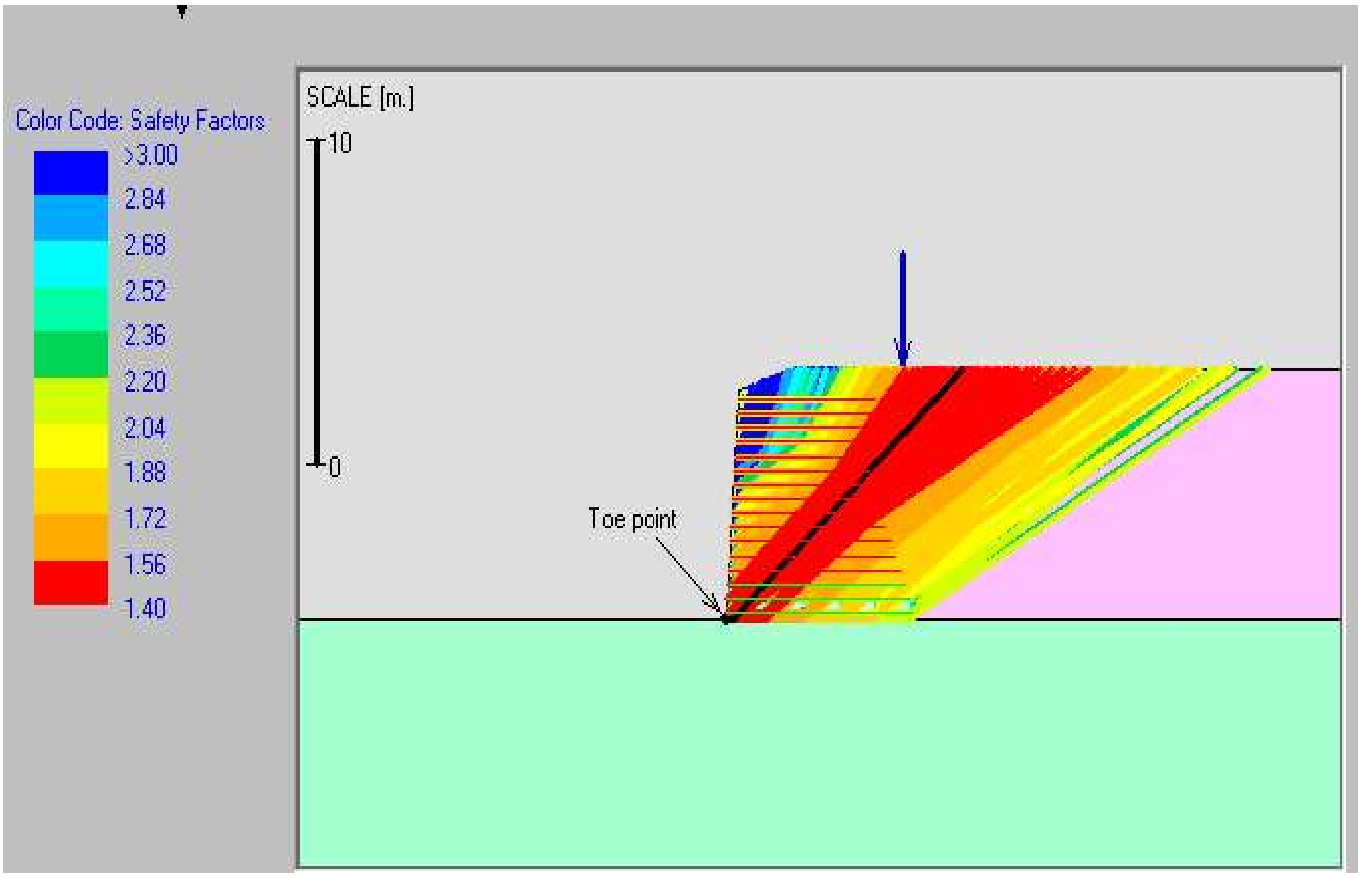
Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE



Belgrade, April 2021

Responsible Design Engineer:

Зоран Луковић, дипл.грађ.инж

лиценца број: / license No.: 310 3032 03

Copyright ?2001-2016 ADAMA Engineering, Inc. www.GeoPrograms.com License number ReWRG-301204

2/4.2.6.2 ПРЕДМЕР И ПРЕДРАЧУН РАДОВА

2/4. 2.6.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783~ km 0+916)

Бр.	Опис радова	Јединица мере	Количина	Јединична цена(дин)	Цена (дин)
			A	B	AxB
01.00	**ПРИПРЕМНИ РАДОВИ**				
01.01	Припремни радови: Радови укључују геодетска мерења, пренос пројектних података на терен, постављање, ажурирање и стабилизацију ознака током периода изградње и прелиминарног пуштања у рад. Ова ставка такође укључује испоруку материјала за горе поменуто и чишћење ситног грмља на земљи. Радови ове позиције биће плаћени паушално.			140.000,00	140.000,00
				УКУПНО ПРИПРЕМНИХ РАДОВА:	**140.000,00**
02.00	**ЗЕМЉАНИ РАДОВИ**				
02.01	Ископ земље за изградњу темеља потпорног зида Ова позиција укључује ископ земљишта 2 и 3 категорије, утовар и одвоз вишка материјала на подручје удаљености до 500 м према упутству инжењера. Мерење ископа треба вршити надоле од нивоа нетакнутог тла. Мерење по m3 ископаног материјала.	m^3	1.359,00	850,00	1.155.150,00
02.02	**Завршно темељно тло (подтло) у подручју носеће конструкције.** Позиција укључује сабијање, откривање ради сушења или влажења нетакнутог тла у зони носеће конструкције и на месту темеља насипа. Сабијање се наставља све док модул горњег слоја не буде Evd=20MPa. Цена покрива контролна мерења сабијања и подношење сертификата коју издаје акредитована лабораторија. Мерење по м2 завршног темељног тла.	m^2	1.410,00	65,00	91.650,00

Бр.	Опис радова	Јединица мере	Количина	Јединична цена(дин)	Цена (дин)
			A	B	AxB
02.03	**Обрада темеља: пуњење песком и шљунком** Позиција укључује набавку, испоруку и пуњење паковања песка и шљунка. У паковање се уноси 0/63 песак и шљунак, сабијених на Evd = 30MPa. Мерење по m3 материјала за пуњење.	m^3	200,00	2.050,00	410.000,00
02.04	**Насипање насипа у зони геомреже** Позиција укључује набавку, испоруку и пуњење материјала у зонама геомреже. Пуњење насипа треба да буде са песком и шљунком 0/63, однос тежине мањи од 75μm је <12%, а коефицијент униформности Cu > 6. Да би се постигла најбоља адхезија између насипа и геомреже, дебљина сваког збијеног слоја је 22 cm, Ev2 треба да буде једнак 45 MN/ m2 у прва 2 метра висине насипа и минимални степен сабијања између 3. метра насипа и врх насипа треба да задовољава Ev2= 60 MN / м2. Мерење по m3 материјала за пуњење.	m^3	6633,00	2.050,00	13.597.650,00
02.05	**Пуњење лесом (глином) темељне јаме ван зида** Ова позиција обухвата затрпавање од слоја за обраду подтла иза зида до темељне јаме на пројектованом тлу. Ископано земљиште се користи као пунило, а дренажни нагиб од најмање 5% постављен је изван зида. Мерење по м3 материјала за пуњење.	m^3	59,00	1.000,00	59.000,00
				УКУПНО ЗЕМЉАНИХ РАДОВА:	**15.313.450,00**

Бр.	Опис радова	Јединица мере	Количина	Јединична цена(дин)	Цена (дин)
			A	B	AxB
03.00	**БЕТОНИРАЊЕ**				
03.01	**Изливање С12 / 15 бетонског тампонског слоја за темељ** Изливање неармираног бетона испод темеља у облику слова L, С12 / 15, дебљине 10 cm Мерење по m3 изливеног бетона.	m^3	11,40	10.000,00	114.000,00
03.02	**Темељи бетона С30/37** Позиција укључује набавку, испоруку материјала, рад за мешање и постављане бетона, сертификат о квалитету и друге радове. Мерење по m3 изливеног бетона.	m^3	29,80	18.000,00	536.400,00
03.03	**Изградa сегментних блок зидних плоча, класа бетона С30 / 37, V-I, М150** У цену је урачуната куповина, испорука и израда сегментних блок зидних плоча. Пројектна величина монтажног блока је 400 × 220 × 220 мм, а класа бетона је С30 / 37, V-I, М150. Мерење по m2 уграђених зидних плоча	m^2	696,00	7.800,00	5.428.800,00
03.04	**Круна за ливење од бетона С30/37** Позиција укључује набавку, испоруку материјала, мешање и постављање (изливање) бетона у зидну круну, сертификат о квалитету и друге радове. Зидна круна је изливена од бетона класе С30 / 37, V-I, М150, у потпуности према пројекту. Мерење по m3 изливеног бетона.	m^3	28,50	20.000,00	570.000,00
				УКУПНО ЗА БЕТОНСКЕ РАДОВЕ:	**6.649.200,00**

Бр.	Опис радова	Јединица мере	Количина	Јединична цена(дин)	Цена (дин)
			A	B	AxB
04.00	**АРМАТУРА**				
04.01	**Ребраста арматура Б500б** Набавка, транспорт, сечење, савијање и учвршћивање арматуре Б500Б у зид темеља. Мерење по кг фиксираних арматура.	kg	1.863,00	125,00	232.875,00
04.02	**Ребраста арматура Б500б** Набавка, транспорт, сечење, савијање и учвршћивање арматуре Б500Б у круну зида темеља. Мерење по кг фиксираних арматура.	kg	2.151,00	125,00	268.875,00
				УКУПНО ЗА АРМАТУРУ:	**501.750,00**
05.00	**ГЕОСИНТЕТИКА**				
05.01	**Полагање аксијалне ХДПЕ геомреже** Цена укључује набавку, сечење и полагање аксијалних HDPE геомрежа према пројектном цртежу. Затезна чврстоћа геомреже треба да задовољава пројектне захтеве следећим условима: пројектована температура 20 °C, радни век пројекта је 120 година, деформација пузања након изградње не већа од 1%. Вредности T_{CR} и T_{CS} морају бити наведени BBA сертификатом. Мерење по m2 положене геомреже. RW-95:T_{CR}≥42.5 ,T_{CS}≥18kN/m	m^2	6.046,00	600,00	3.627.600,00
	RW-125:T_{CR}≥55.5,T_{CS}≥24kN/m	m^2	6.317,00	750,00	4.737.750,00
				УКУПНО ЗА ГЕОСИНТЕТИКУ:	**8.365.350,00**
06.00	**ДРЕНАЖА**				
06.01	**Дренажа шљунка иза зида** У цену је урачуната куповина и полагање материјала од слоја шљунчаног филтера, а величина честица пунила филтарског слоја је 16/32. Мерење по м3 постављеног шљунка.	m^3	384,00	2.800,00	1.075.200,00

Бр.	Опис радова	Јединица мере	Количина	Јединична цена(дин)	Цена (дин)
			A	B	AxB
06.02	**Полагање слоја геотекстилног филтера** У цену је урачуната куповина и полагање нетканог пропустљивог геотекстила (300 g / m2). Мерење по m2 постављеног геотекстила.	m^2	846,00	320,00	270.720,00
				УКУПНО ДРЕНАЖНИ РАДОВИ:	**1,345,920.00**
07.00	**ОСТАЛО**				
07.01	**Заштитна ограда на круни зида** Позиција укључује набавку, транспорт и поправљање заштитне ограде на круни зида. Мерење по m фиксиране ограде.	m		12.000,00	0,00
				УКУПНО ОСТАЛО:	**0,00**

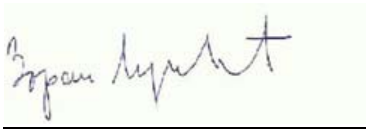
РЕКАПИТУЛАЦИЈА		
01.00	**ПРИПРЕМНИ РАДОВИ**	**140.000,00**
02.00	**ЗЕМЉАНИ РАДОВИ**	**15.313.450,00**
03.00	**БЕТОНИРАЊЕ**	**6.649.200,00**
04.00	**АРМАТУРА**	**501.750,00**
05.00	**ГЕОСИНТЕТИКА**	**8.365.350,00**
06.00	**ДРЕНАЖА**	**1.345.920,00**
07.00	**ОСТАЛО**	**0,00**
	УКУПНО (Дин):	**32.315.670,00**

Belgrade, April 2021

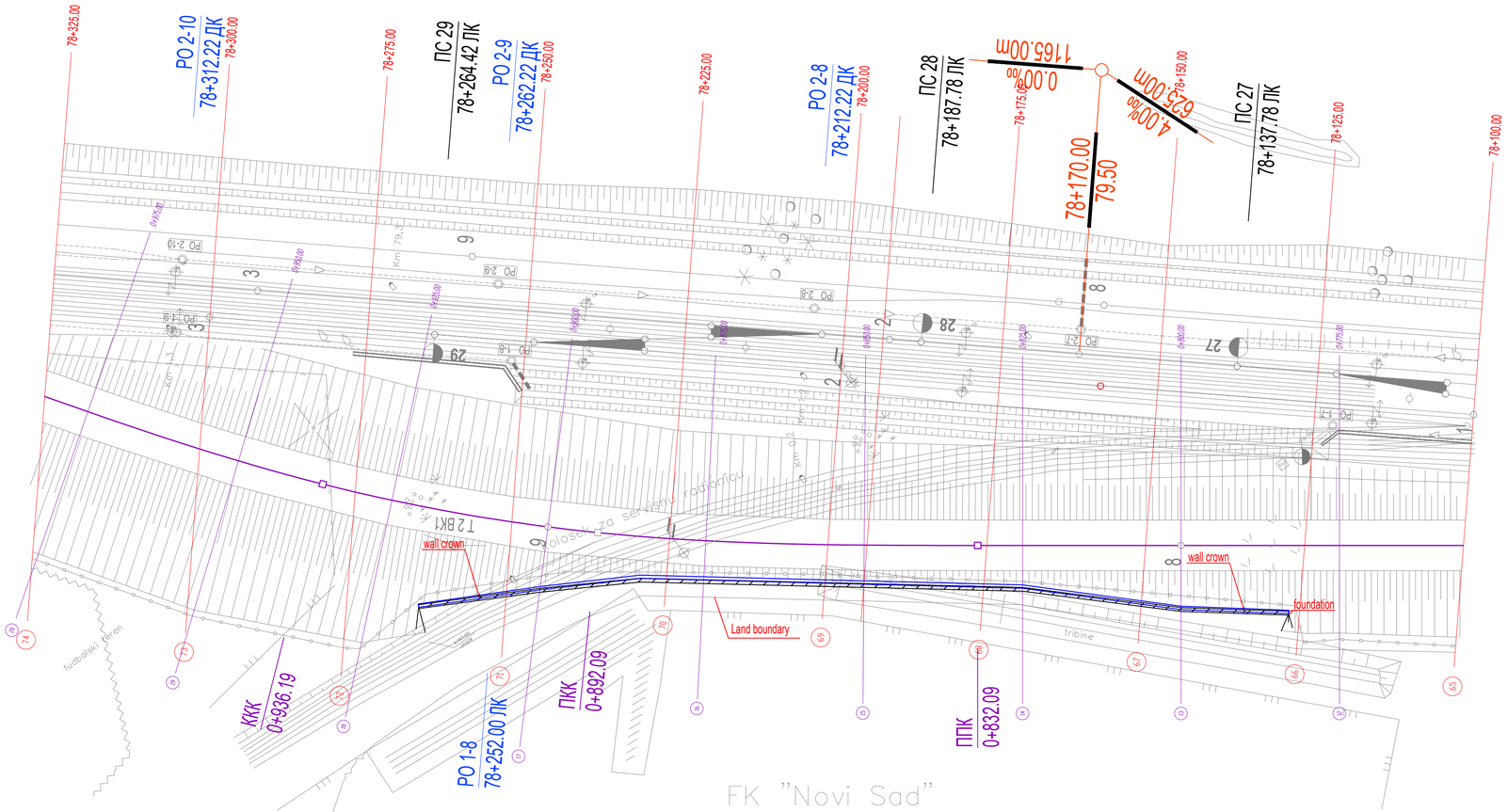
Responsible Design Engineer:

Зоран Луковић, дипл.грађ.инж

license No.: 310 3032 03



2/4.2.7 ГРАФИЧКА ДОКУМЕНТАЦИЈА



03		
02		
01		
Број/Number	Датум / Date	Опис / Description

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia
Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Сарадници: / Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Главни пројектант: / Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6IV, Београд / Nemanjina Street 6IV, Belgrade

Наручилац пројекта: / Employer:
中国铁路国际有限公司 CHINA RAILWAY International Co., Ltd.
China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing
P.R China, 100844

中国通信建设 CHINA COMMUNICATIONS CONSTRUCTION COMPANY LIMITED
China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing
P.R China, 100088

Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE
SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

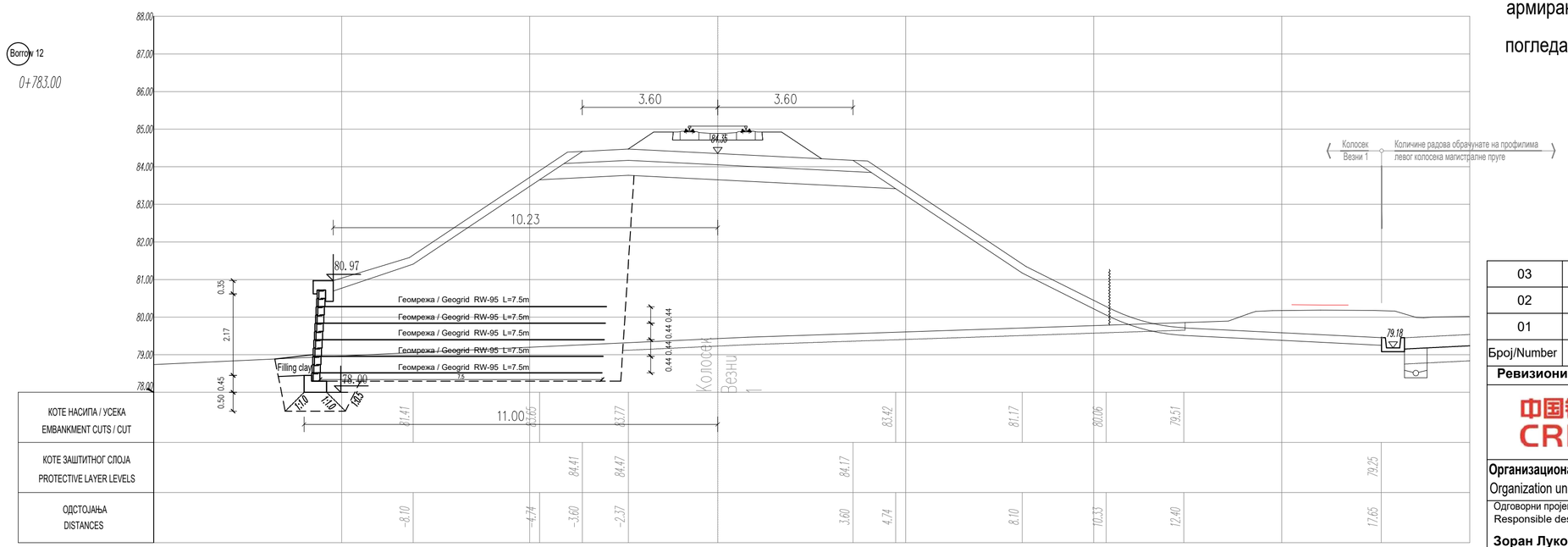
Део пројекта: / Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Цртеж:/ Drawing: **СИТУАЦИЈА**/Layout drawing
Размера: Scale: 1:500

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP
датум/date: **04.2021.**
Цртеж бр. /Drawing No.: **2020-001-ГС-2/4.2-Ц1**

Description:
This section drawing is only for reinforced soil walls, and the design drawing of the subgrade section shall be subject to 2/2.

Опис:
Овај цртеж пресека односи се само на потпорне зидове од армиране земље, а за пројектни цртеж пресека доњег строја погледати документ 2/2.



Број/Number	Датум / Date	Опис / Description
03		
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Сарадници: / Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Главни пројектант: / Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer:
中国铁路国际有限公司 CHINA RAILWAY International Co, Ltd.
China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing
P.R China, 100844

CHINA COMMUNICATIONS CONSTRUCTION COMPANY LIMITED
China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing
P.R China, 100088

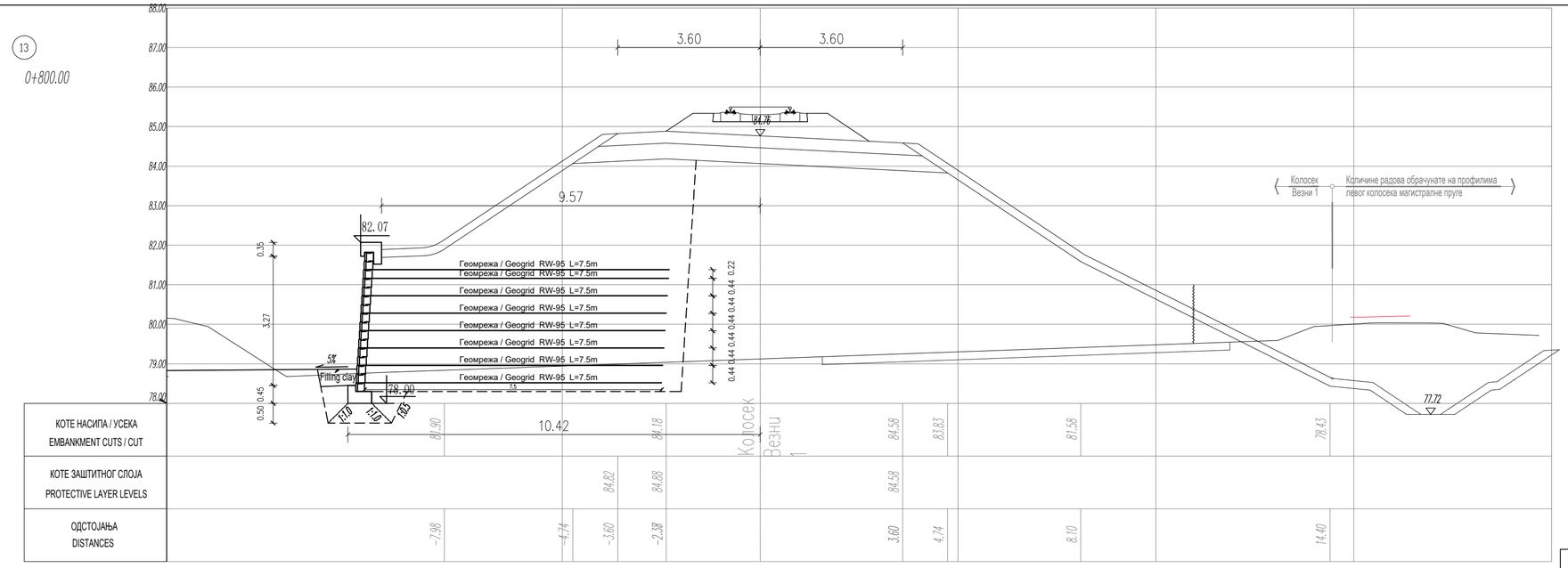
Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE
SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

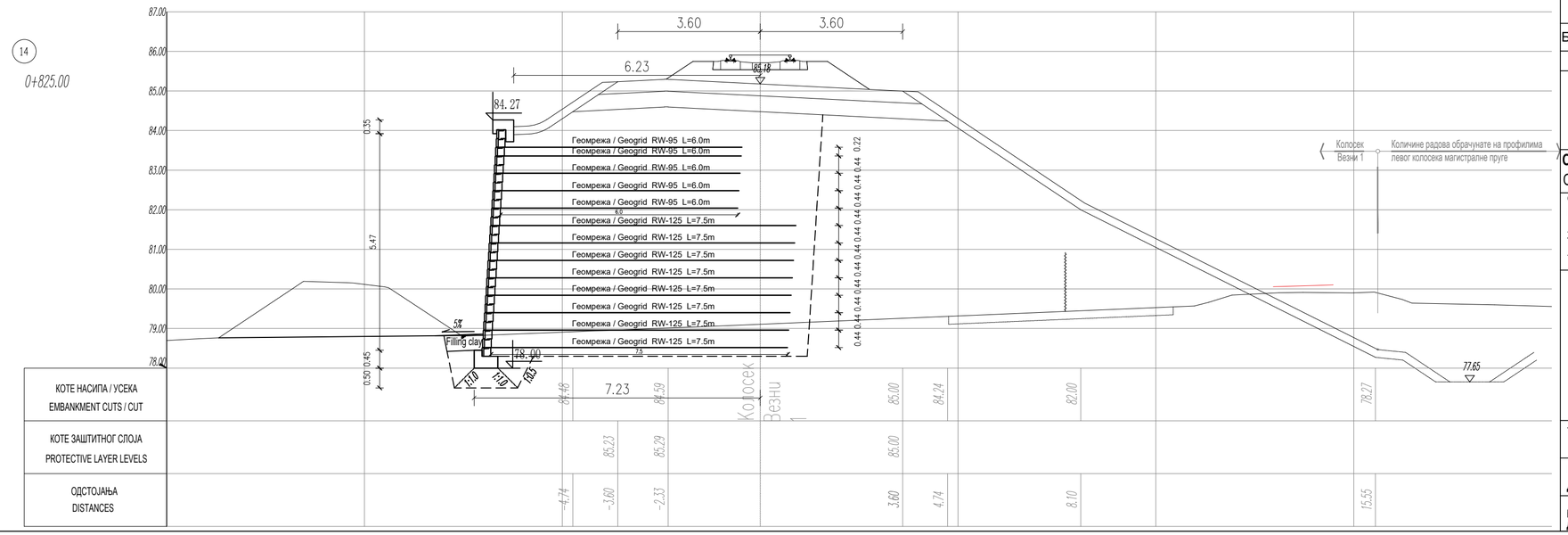
Део пројекта:/ Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Цртеж:/ Drawing:
Попречни пресеци зида од армиране земље
Cross-sections of reinforced earth wall

Размера: Scale: 1:100

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP
датум:/date: **04.2021.**
Цртеж бр./Drawing No.: **2020-001-ГС-2/4.2-Ц2.1**





Description:
This section drawing is only for reinforced soil walls, and the design drawing of the subgrade section shall be subject to 2/2.
Опис:
Овај цртеж пресека односи се само на потпорне зидове од армиране земље, а за пројектни цртеж пресека доњег строја погледати документ 2/2.

Број/Number	Датум / Date	Опис / Description
03		
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Сарадници: / Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Главни пројектант: / Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer:
中国铁路国际有限公司 CHINA RAILWAY International Co, Ltd. — China Railway International Corporation Ltd. No.10 Fuxing Road,Haidian District,Beijing P.R China, 100844
CHINA COMMUNICATIONS CONSTRUCTION COMPANY LIMITED — China Communication Construction Company Ltd. (CCCC) No.85 Deshengmenwai Street,Xicheng District,Beijing P.R China, 100088

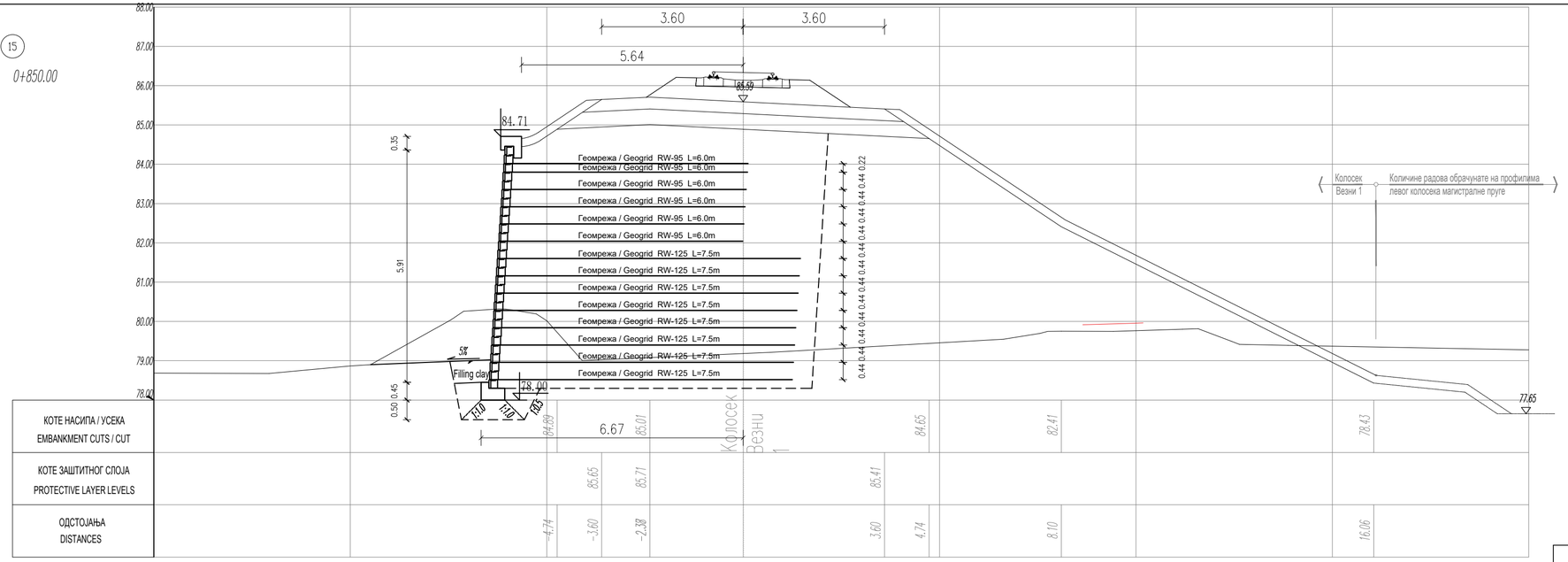
Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE
SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

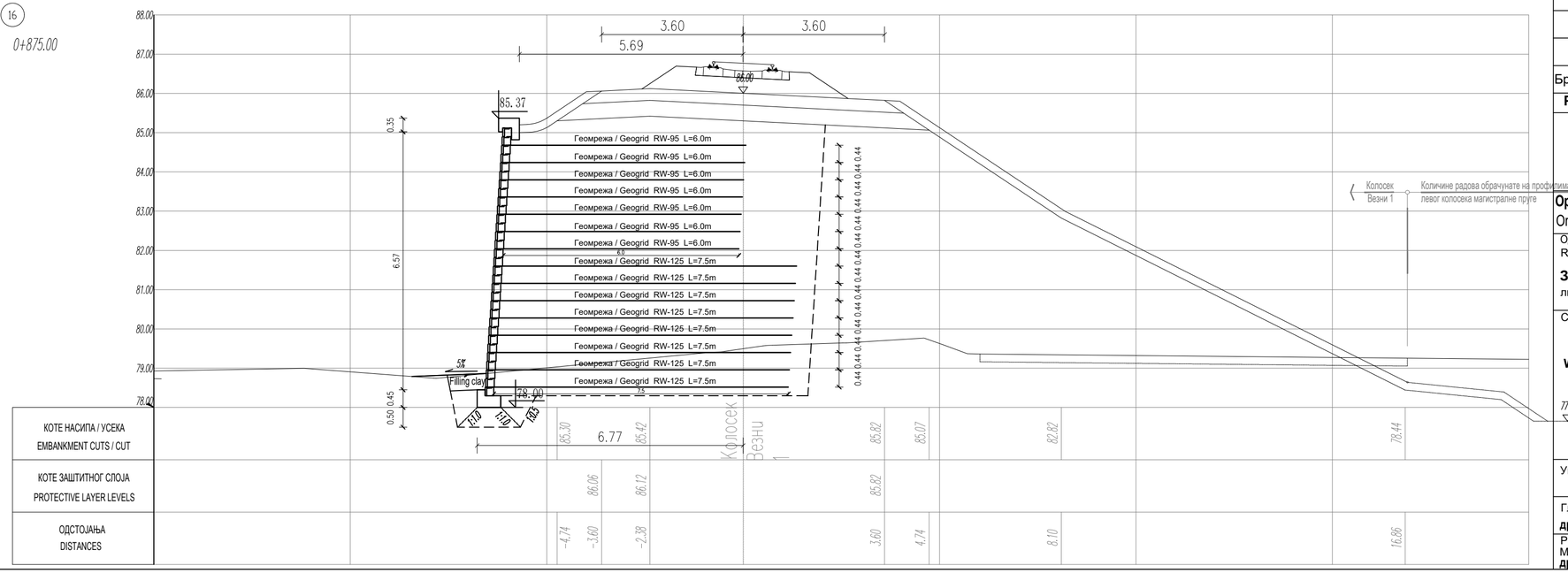
Део пројекта:/ Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Цртеж:/ Drawing:
Попречни пресеци зида од армиране земље
Cross-sections of reinforced earth wall

Размера: Scale: 1:100

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP
датум:/date: **04.2021.**
Цртеж бр./Drawing No.: **2020-001-ГС-2/4.2-Ц2.2**





Description:
This section drawing is only for reinforced soil walls, and the design drawing of the subgrade section shall be subject to 2/2.

Опис:
Овај цртеж пресека односи се само на потпорне зидове од армиране земље, а за пројектни цртеж пресека доњег строја погледати документ 2/2.

Број/Number	Датум / Date	Опис / Description
03		
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Сарадници: / Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Главни пројектант: / Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer:
中国铁路国际有限公司 CHINA RAILWAY International Co, Ltd.
China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing
P.R China, 100844
CHINA COMMUNICATIONS CONSTRUCTION COMPANY LIMITED
China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing
P.R China, 100088

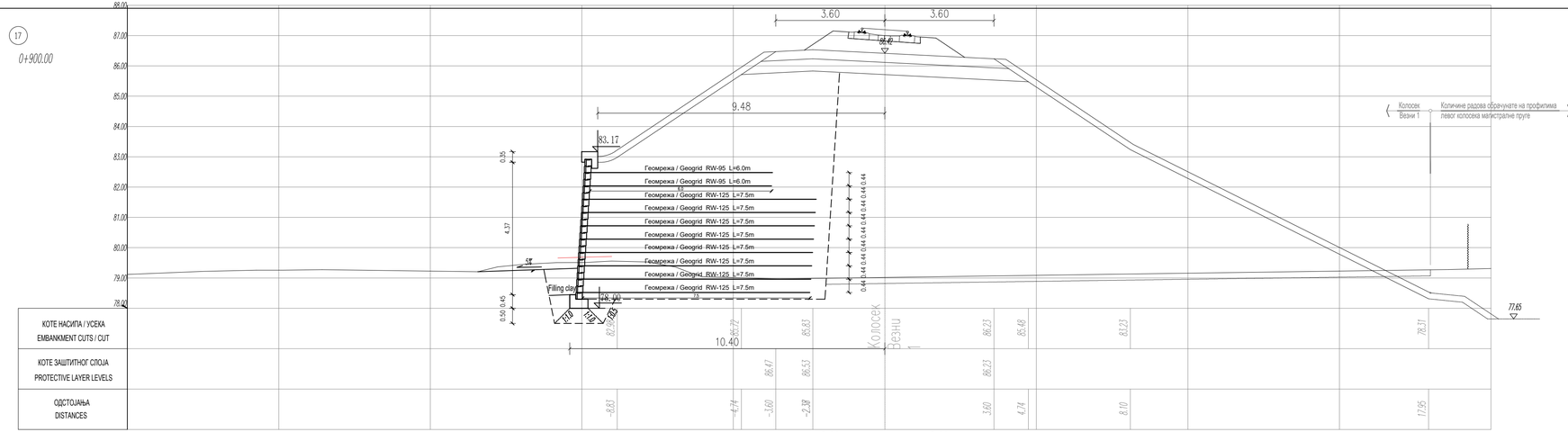
Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE
SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Део пројекта:/ Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Цртеж:/ Drawing:
Попречни пресеци зида од армиране земље
Cross-sections of reinforced earth wall

Размера: Scale: 1:100

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP
датум:/date: **04.2021.**
Цртеж бр./Drawing No.: **2020-001-ГС-2/4.2-Ц2.3**



Description:
This section drawing is only for reinforced soil walls, and the design drawing of the subgrade section shall be subject to 2/2.

Опис:
Овај цртеж пресека односи се само на потпорне зидове од армиране земље, а за пројектни цртеж пресека доњег строја погледати документ 2/2.

Број/Number	Датум / Date	Опис / Description
03		
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 166; 11000 Београд; Србија

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Сарадници: / Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Инвеститор пројекта: / Inveestor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6IV, Београд / Nemanjina Street 6IV, Belgrade

Наручилац пројекта: / Employer:
China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing
P.R China, 100844
China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing
P.R China, 100088

Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE
SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Део пројекта: / Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

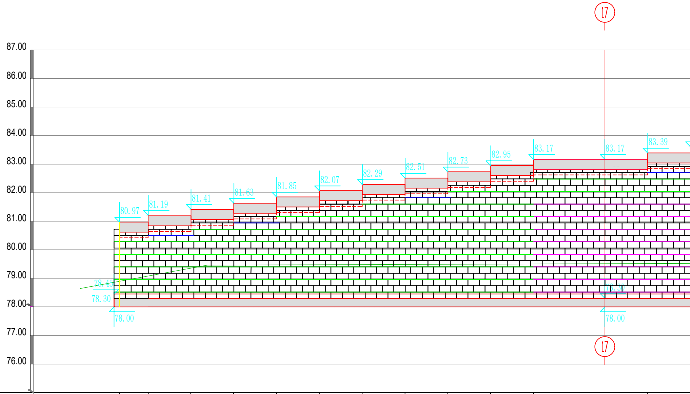
Главни пројектант: / Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Цртеж:/ Drawing:
Попречни пресеци зида од армиране земље
Cross-sections of reinforced earth wall

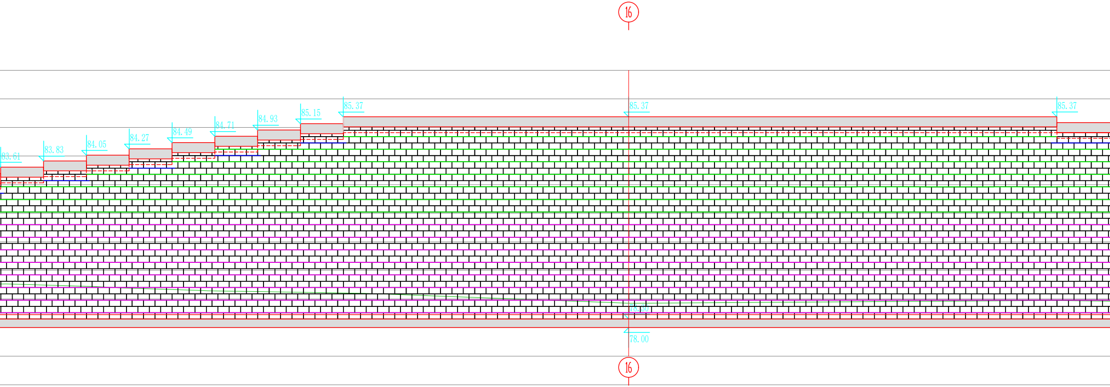
Размера: Scale: 1:100

Врста тех. док.: Type of tech. docum.:	датум:/date	Цртеж бр. /Drawing No.:
ПГД / DCP	**04.2021.**	**2020-001-ГС-2/4.2-Ц2.4**



geogrid Геомрежа		917–916	916–914.5	914.5–913	913–911.5	911.5–910	910–908.5	908.5–907	907–905.5	905.5–904	904–902.5	902.5–898.5	898.5–897
RW-95	Layer number × length	5×7.5m	6×7.5m	6×7.5m	7×7.5m	7×7.5m	8×7.5m	8×7.5m	9×7.5m	9×7.5m	10×7.5m	2×6.0m	3×6.0m
RW-125	Layer number × length											8×7.5m	8×7.5m

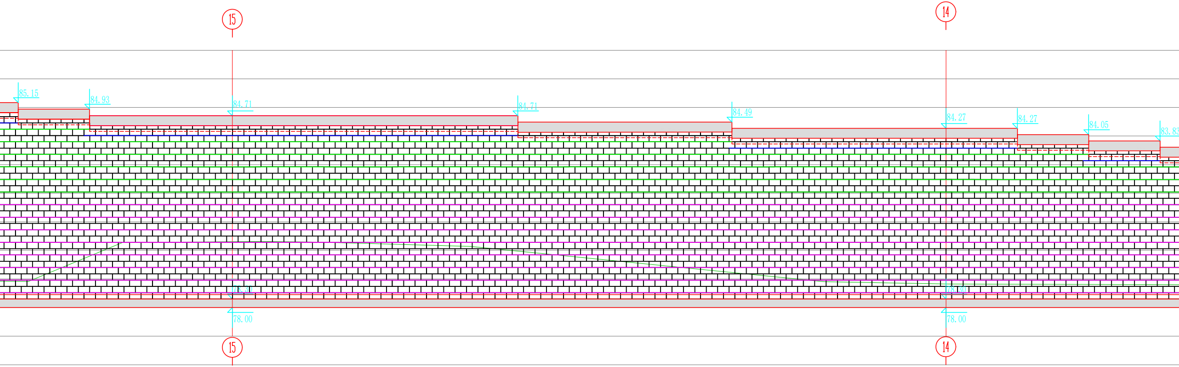
VK1 mileage VK1 Стационажа	VK1 km0+917	916	914.5	913	911.5	910	908.5	907	905.5	904	902.5	km0+900	+898.5	+897
elevation Кота – Crown at the top of the wall Круна на врху зида	80.97	80.97 81.19	81.19 81.41	81.41 81.63	81.63 81.85	81.85 82.07	82.07 82.29	82.29 82.51	82.51 82.73	82.73 82.95	82.95 83.17	83.17	83.17 83.39	83.39
elevation Кота – ground Кота терена												79.32		
elevation Кота – Bottom of foundation Дно темеља	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00



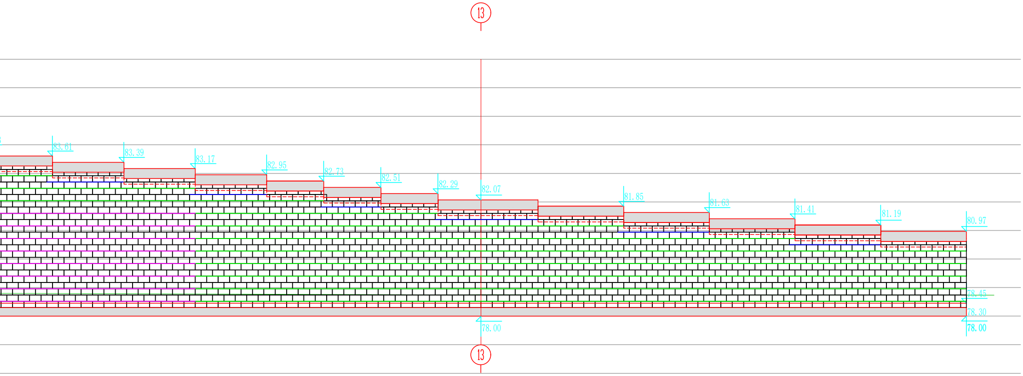
3×6.0m	4×6.0m	4×6.0m	5×6.0m	5×6.0m	6×6.0m	6×6.0m	7×6.0m	7×6.0m		7×6.0m
8×7.5m	8×7.5m	8×7.5m	8×7.5m	8×7.5m	8×7.5m	8×7.5m	8×7.5m	8×7.5m		8×7.5m
83.61 83.61	83.83 83.83	84.05 84.05	84.27 84.27	84.49 84.49	84.71 84.71	84.93 84.93	85.15 85.15	85.37 85.37	85.37	85.15
								78.86		
78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	
+895.5	+894	+892.5	+891	+889.5	+888	+886.5	+885	km0+875	+860	

ИЗГЛЕД ЗИДА ОД АРМИРАНЕ ЗЕМЉЕ

Front view of reinforced soil retaining wall



	6×6.0m	6×6.0m		5×6.0m	5×6.0m		4×6.0m	4×6.0m	
	8×7.5m	8×7.5m		8×7.5m	8×7.5m		8×7.5m	8×7.5m	
85.15	84.93 84.93	84.71 84.71	84.71	84.49 84.49	84.27 84.27	84.27	84.05 84.05	83.83 83.83	83.61
		79.02			78.86				
78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	
+857.5	+855	km0+850	+840	+832.5	km0+825	+822.5	+820	+817.5	



3×6.0m	3×6.0m	2×6.0m	10×7.5m	9×7.5m	9×7.5m	8×7.5m	8×7.5m		7×7.5m	7×7.5m	6×7.5m	6×7.5m	5×7.5m
8×7.5m	8×7.5m	8×7.5m											
83.61	83.39 83.39	83.17 83.17	82.95 82.95	82.73 82.73	82.51 82.51	82.29 82.29	82.07 82.07	82.07	81.85 81.85	81.63 81.63	81.41 81.41	81.19 81.19	80.97 80.97
							78.86						
78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00
+815	+812.5	+810	+807.5	+805.5	+803.5	+801.5	km0+800	+798	+795	+792	+789	+786	VK1 km0+783

Број/Number	Датум / Date	Опис / Description
03		
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia
Ogranak Beograd

Косте Рацина 16б; 11000 Београд; Србија

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer:

中国铁路国际有限公司
CHINA RAILWAY International Co., Ltd.

China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing
P.R China, 100844

CHINA COMMUNICATIONS CONSTRUCTION COMPANY LIMITED

China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing
P.R China, 100088

Сарадници: / Associates:
Wang Jian. Bachelor & Xia Qidi.Master
王 剑

Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE
SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Део пројекта: / Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor
王 剑

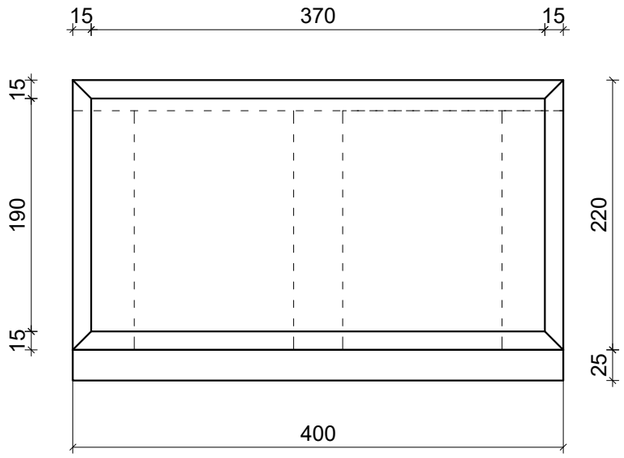
Главни пројектант: / Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Цртеж:/ Drawing:
ИЗГЛЕД ЗИДА ОД АРМИРАНЕ ЗЕМЉЕ
Front view of reinforced soil retaining wall

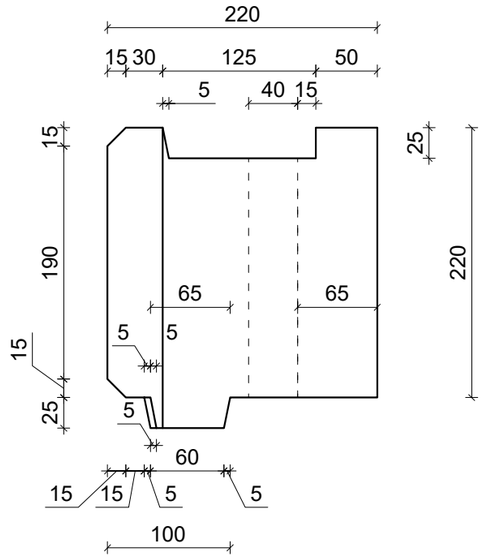
Размера:
Scale:
1:100

Врста тех. док.: Type of tech. docum.:	датум:/date:	Цртеж бр./Drawing No.:
ПГД / DCP	**04.2021.**	**2020-001-ГС-2/4.2-Ц3**



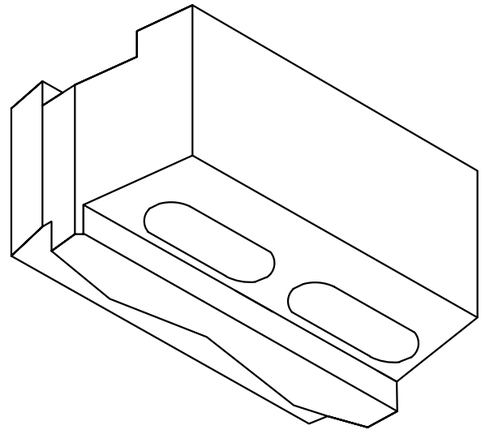
Front View / Поглед спреда

1:5

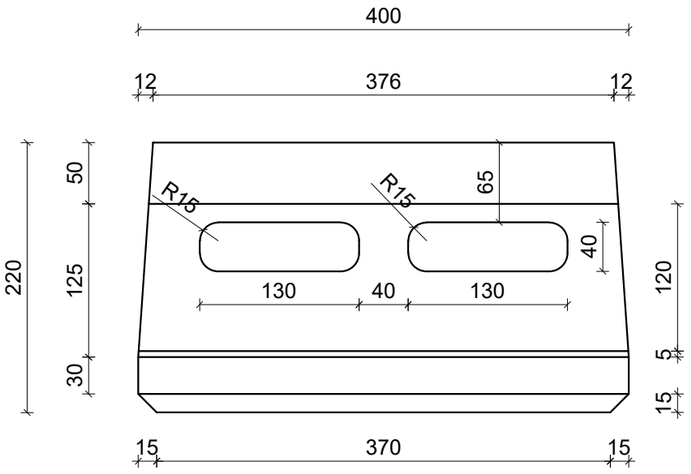


Side View / Поглед са стране

1:5

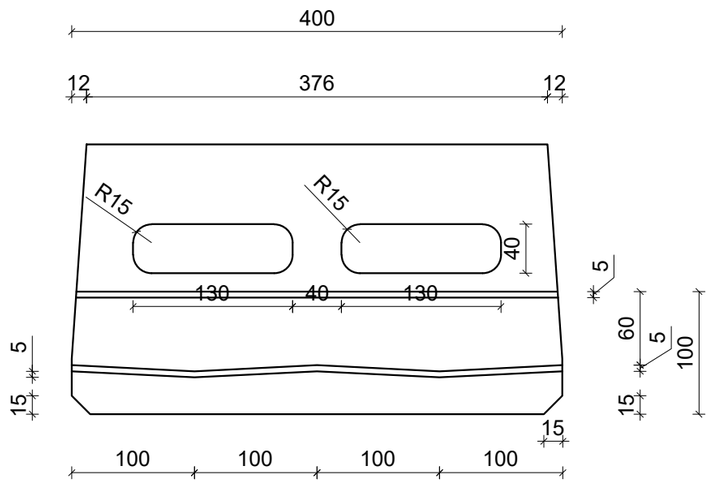


Sketch of Concrete block showing shape of tongue underneath
Скица бетонског блока, приказује облик језичка испод



Top View / Поглед одозго

1:5



Upward View / Поглед одоздо

1:5

Note/ Белешка:

1.Unit: mm./Јединица: mm.

2.Block dimension:400×220×220mm, Precast by concrete C30/37, V-Ⅰ, XF3. / Димензије блока: 400×220×220mm, префабрикован од бетона C30/37, VI, XF3

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
/Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Број/Number	Датум / Date	Опис / Description
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer: China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing P.R China, 100844

China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing P.R China, 100088
Web site: www.ccccltd.cn

Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Сарадници:/ Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Главни пројектант:/ Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Део пројекта: / Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

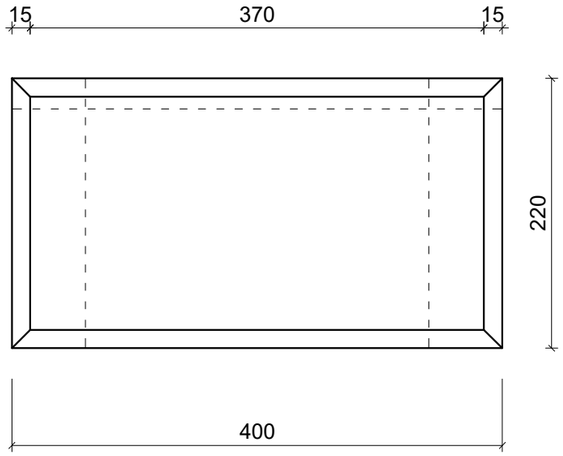
Цртеж:/ Drawing:
Деталь бетонског блока / Details of concrete blocks

Размера: Scale: 1:5

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP

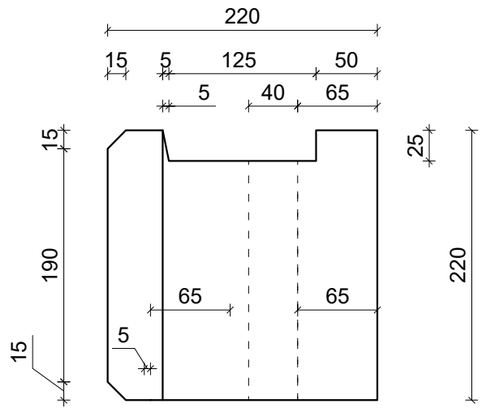
датум:/date: **04.2021.**

Цртеж бр./Drawing No.: **2020-001-ГС-2/4.2-Ц4.1**



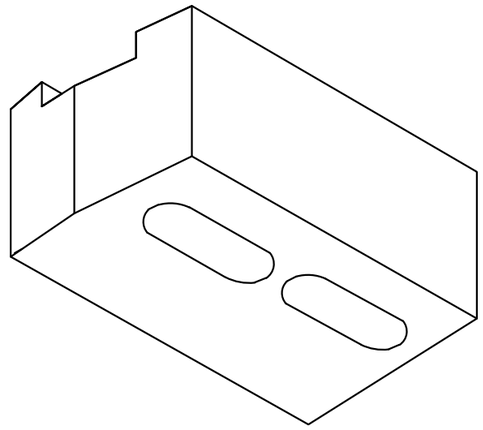
Front View / Поглед спреда

1:5

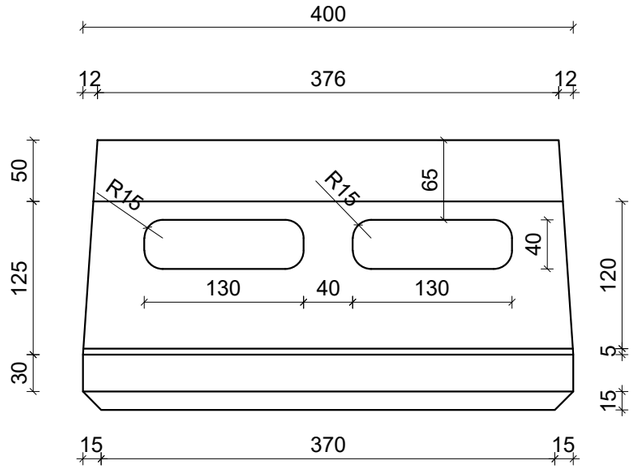


Side View / Поглед са стране

1:5

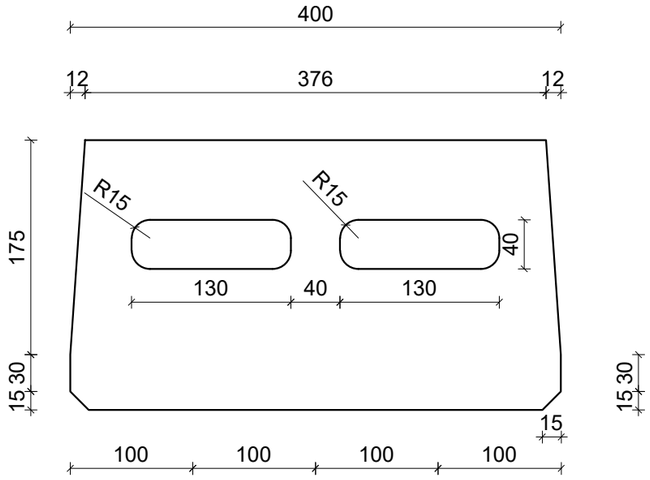


Sketch of concrete block with flat surface for connecting concrete foundation
Скица бетонског блока који повезује равну доњу површину бетонског темеља



Top View / Поглед одозго

1:5



Upward View / Поглед одоздо

1:5

Note/ Белешка:

1.Unit: mm./Јединица: mm.
2.Block dimension:400×220×220mm, Precast by concrete C30/37, V-Ⅰ, XF3. / Димензије блока: 400×220×220mm, префабрикован од бетона C30/37, VI, XF3

02		
01		
Број/Number	Датум / Date	Опис / Description

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia
Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer: China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing P.R China, 100844

China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing P.R China, 100088
Web site: www.ccccltd.cn

Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
/Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Сарадници:/ Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Главни пројектант:/ Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Део пројекта: / Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

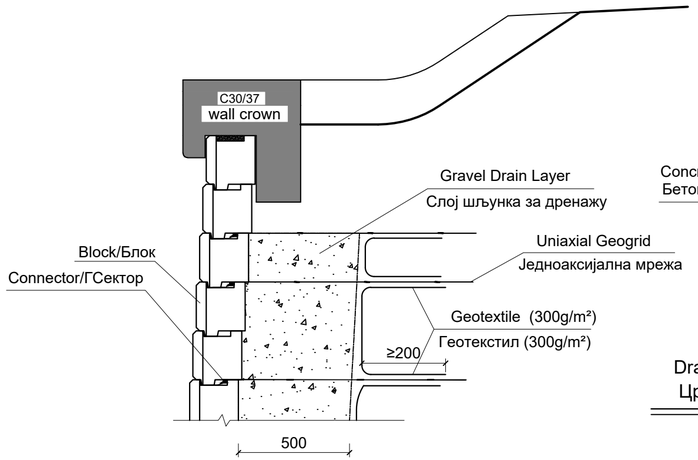
Цртеж:/ Drawing:
Деталь бетонског блока /
Details of concrete blocks

Размера: Scale: 1:5

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP

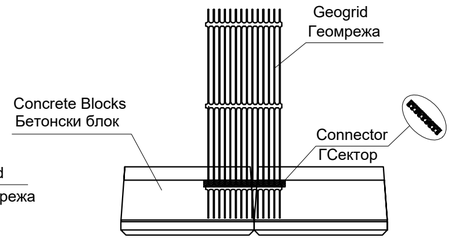
датум:/date: **04.2021.**

Цртеж бр./Drawing No.: **2020-001-ГС-2/4.2-Ц4.2**



Structure drawing of the wall crown and module system
Цртеж ГСструкције круне зида и система блокова

1:20



Drawing of Uniaxial Geogrid and Blocks Connection
Цртеж везе једноаксијалне геомреже и блокова

Note: / Белешка:

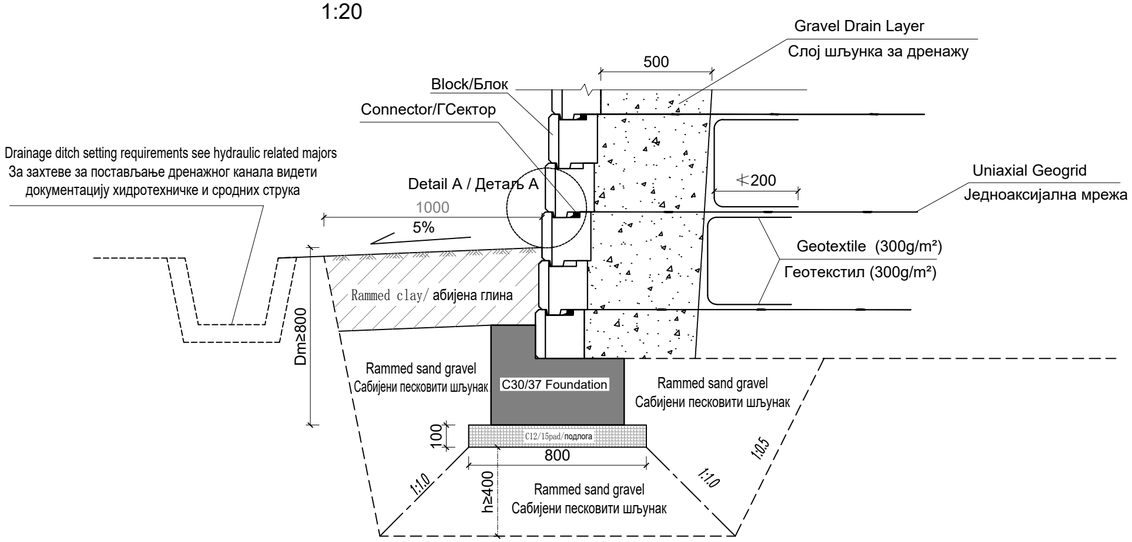
1.Unit: mm. / Јединица: mm.

2.Block dimension:400*220*220mm, Concrete properties shall be of minimum C30/37, V-Ⅰ waterproofing, XF3 frost resistance and 2100kg/m³ gross density. / Димензије блока: 400×220×220mm, својства бетона морају бити минимално C30/37, отпорност на воду V-I, отпорност на смрзавање XF3 и бруто густина 2100kg/m³.

3.Connector is used for joint between blocks and geogrids. / Користи се ГСектор за спајање блокова и геомрежа.

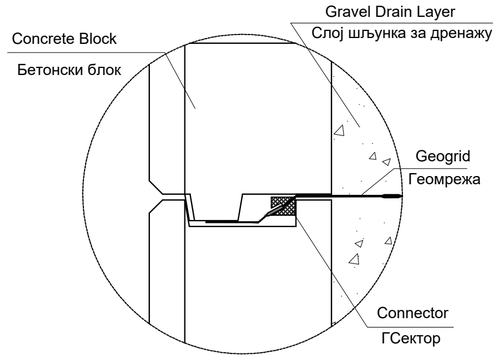
4.All the geosynthetics products which shall be used in the construction of wall must have valid certificate issued by authorized institution of EU, this also refers to reinforced soil wall as a system. The system should be certified by British Board of Agreement, such certification should be provided. / Сви геосинтетички производи који ће се користити у изградњи зида морају имати важећи сертификат издат од овлашћене институције ЕУ, а то се такође односи и на потпорни зид од армиране земље као систем. Систем треба да буде сертификован од стране British Board of Agreement (BBA), потребно је обезбедити такву потврду.

5.The technical requirements for the installation of the drainage system outside the wall can be found in the design drawings of related professions such as hydraulic engineering and roadbed, it is not considered in this design drawing. / Технички захтеви за уградњу дренажног система ван зида могу се наћи у пројектним цртежима повезаних струка као што су хидротехника и земљани труп. Овај пројектни цртеж то не узима у обзир.



Ground treatment sectional drawing, foundation and module system structure drawing
Пресек обраде темељног тла, цртеж темеља и ГСструкције система блокова

1:20



Drawing of detail A
Детаљ А

03		
02		
01		
Број/Number	Датум / Date	Опис / Description

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Сарадници: / Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Главни пројектант: / Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer:
中国铁路国际有限公司 CHINA RAILWAY International Co, Ltd.
China Railway International Corporation Ltd. No.10 Fuxing Road,Haidian District,Beijing P.R China, 100844
China Communication Construction Company Ltd. (CCCC) No.85 Deshengmenwai Street,Xicheng District,Beijing P.R China, 100088

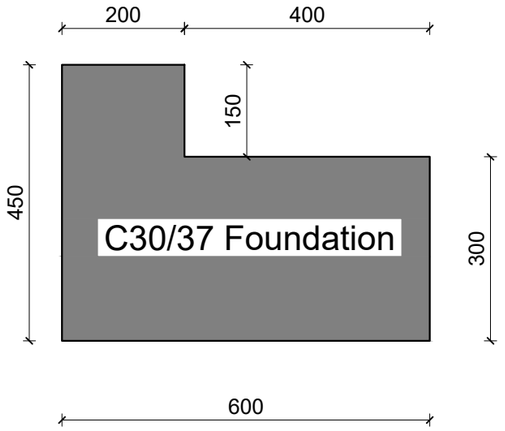
Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE
SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Део пројекта:/ Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Цртеж:/ Drawing:
Систем блокова и темељи, цртеж ГСструкције круне зида / Module system and foundation, wall crown structure drawing

Размера: Scale: 1:20

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP
датум:/date: **04.2021.**
Цртеж бр./Drawing No.: **2020-001-ГС-2/4.2-Ц5**



Cross Section Drawing of Foundation
Темељ - попречни пресек

1:10

Note / Белешка:

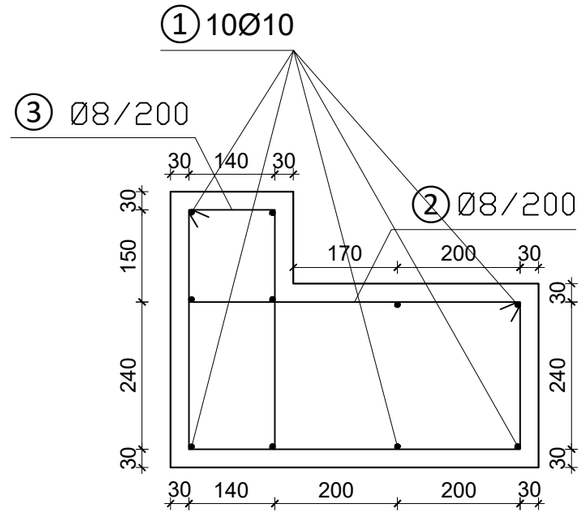
1.Unit mm / Јединица mm

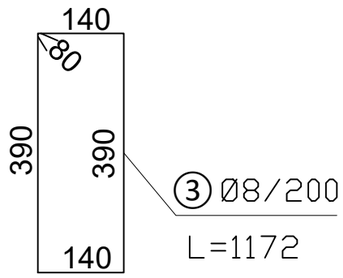
2.Wall crown and Foundation are casted on site. / Круна на зиду и темељ се изливају на локацији.

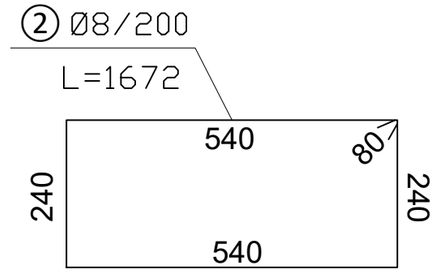
3.Reinforcing steel: B500b / Арматурни челик: B500b

4.Wall crown and Foundation: concrete C30/37, V-Ⅰ, XF3. / Круна зида и темељ: бетон C30/37, V-I, XF3

5.Protective concrete layer a_0=3.0cm / Заштитни слој бетона a_0=3.0cm







SPECIFICATION OF RIBBED FITTINGS _ FOUNDATION（Per linear meter）					
3	8	1.17	6	7.02	
2	8	1.67	6	10.02	
1	10	1.00	10		10.00
Serial number	**Ø**	**length**	**root**	**8**	**10**
∑ lgn / Ø			**m'**	17.04	10.00
∑ weight / Ø			**kg**	6.90	6.34
∑ total			**kg**	***13.24***	

1000

① Ø10 L=1000 (10 root)

Foundation reinforcement drawing
Цртеж арматуре темеља

Број/Number	Датум / Date	Опис / Description
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 166; 11000 Београд; Србија

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer: China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing P.R China, 100844

China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing P.R China, 100088
Web site: www.ccccltd.cn

Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
/Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Сарадници:/ Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Главни пројектант:/ Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

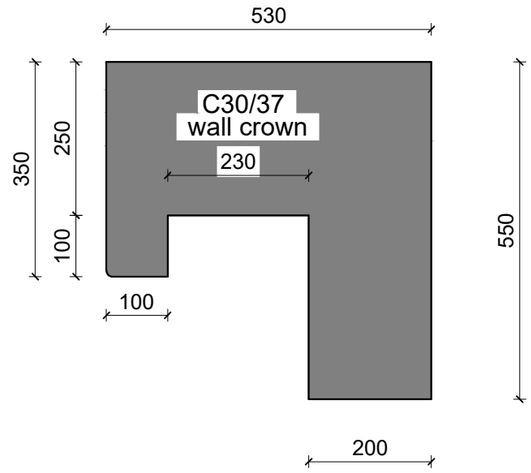
Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Део пројекта: / Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Цртеж:/ Drawing:
Цртеж арматуре темеља /
Foundation reinforcement drawing

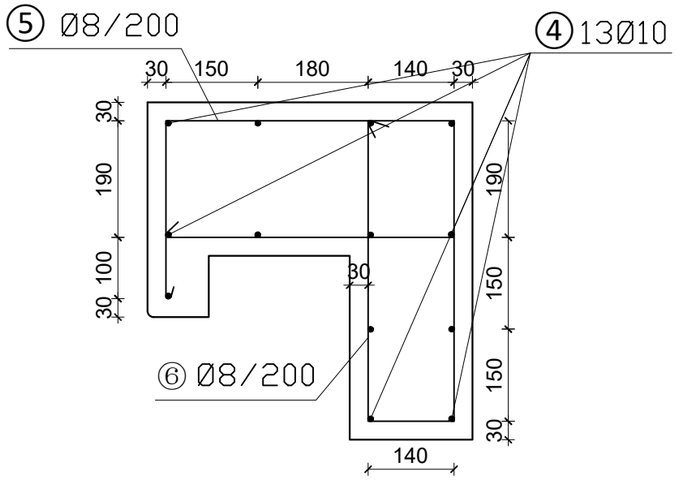
Размера: Scale: 1:10

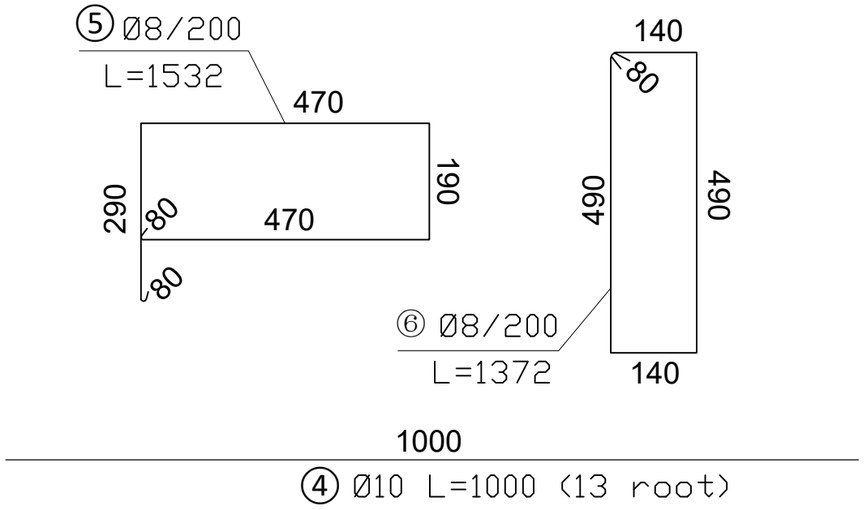
Врста тех. док.: Type of tech. docum.:	датум:/date:	Цртеж бр./Drawing No.:
ПГД / DCP	**04.2021.**	**2020-001-ГС-2/4.2-Ц6**



Cross Section Drawing of wall crown
Попречни пресек круне зида

1:10





Wall crown reinforcement drawing
Цртеж арматуре круне зида

SPECIFICATION OF RIBBED FITTINGS_Wall crown（Per linear meter）					
6	8	1.37	6	8.22	
5	8	1.53	6	9.18	
4	10	1.00	13		13.00
Serial number	**Ø**	**length(m)**	**root**	**8**	**10**
∑ lgn / Ø			**m'**	17.40	13.00
∑ weight / Ø			**kg**	7.05	8.24
∑ total			**kg**	***15.29***	

Note / Белешка:

1.Unit mm / Јединица mm

2.Wall crown and Foundation are casted on site. / Круна на зиду и темељ се изливају на локацији.

3.Reinforcing steel: B500b / Арматурни челик: B500b

4.Wall crown and Foundation: concrete C30/37, V-Ⅰ, XF3. / Круна зида и темељ: бетон C30/37, V-I, XF3

5.Protective concrete layer a_0=3.0cm / Заштитни слој бетона a_0=3.0cm

Број/Number	Датум / Date	Опис / Description
02		
01		

Ревизиони блок: / Revision block:

China Railway Design Corporation Serbia Ogranak Beograd
Косте Рацина 16б; 11000 Београд; Србија

Инвеститор пројекта: / Investor:
" ИНФРАСТРУКТУРА ЖЕЛЕЗНИЦЕ СРБИЈЕ " А.Д.
/ " INFRASTRUCTURE RAILWAYS OF SERBIA " JSC
Немањина 6/IV, Београд / Nemanjina Street 6/IV, Belgrade

Наручилац пројекта: / Employer: China Railway International Corporation Ltd.
No.10 Fuxing Road,Haidian District,Beijing P.R China, 100844

China Communication Construction Company Ltd. (CCCC)
No.85 Deshengmenwai Street,Xicheng District,Beijing P.R China, 100088
Web site: www.ccccltd.cn

Објекат: /Structure:
ПРУГА БЕОГРАД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
ДЕОНИЦА ПРУГЕ НОВИ САД - СУБОТИЦА - ДРЖАВНА ГРАНИЦА (КЕЛЕБИЈА)
BELGRADE - SUBOTICA - STATE BORDER (KELEBIA) RAILWAY LINE SECTION : NOVI SAD - SUBOTICA - STATE BORDER (KELEBIA)

Организациона јединица: ГРАЂЕВИНАРСТВО И САОБРАЋАЈ
/Organization unit: DEPARTMENT OF CIVIL AND TRANSPORTATION

Одговорни пројектант:
Responsible designer:
Зоран Луковић, дипл.грађ.инж
лиценца број:/ license No.: 310 3032 03

Унутрашња ГСтрола: / Internal control:
Wang Jian. Bachelor

Сарадници:/ Associates:
Wang Jian. Bachelor & Xia Qidi.Master

Главни пројектант:/ Chief designer:
др Љиљана Милић Марковић, дипл.грађ.инж.

Руководилац организационе јединице:
Manager of organization unit:
др Љиљана Милић Марковић, дипл.грађ.инж.

Део пројекта: / Part of Design:
ПРОЈЕКАТ ПОТПОРНИХ КОНСТРУКЦИЈА / DESIGN OF RETAINING WALLS
2/4.2 Зид од армиране земље поред стадиона ФК Нови Сад (km 0+783 ~ km 0+916)
2/4.2 Reinforced Soil Wall beside FK Novi Sad stadium (km 0+783 ~ km 0+916)

Цртеж:/ Drawing:
Цртеж арматуре круне зида /
Wall crown reinforcement drawing

Размера: Scale: 1:10

Врста тех. док.: Type of tech. docum.: **ПГД** / DCP

датум:/date: **04.2021.**

Цртеж бр./Drawing No.: **2020-001-ГС-2/4.2-Ц7**